

THE EMERGENCIES OF A GENERAL PRACTICE

BY

NATHAN CLARK MORSE, A.B., M.D., F.A.C.S.

SURGEON TO EMERGENCY HOSPITAL, ELDORA, IOWA; DISTRICT SURGEON CHICAGO
NORTHWESTERN RAILWAY, MINNEAPOLIS & ST. LOUIS RAILWAY; EX-PRESIDENT
IOWA STATE ASSOCIATION OF RAILWAY SURGEONS; EX-VICE-PRESIDENT,
PAN-AMERICAN CONGRESS; FELLOW AMERICAN MEDICAL ASSOCIA-
TION; MEMBER OF THE SOCIETY OF CLINICAL SURGEONS
OF NORTH AMERICA; AUTHOR OF "POST-
OPERATIVE TREATMENT."

WITH 251 ILLUSTRATIONS

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TO

E. WYLLYS ANDREWS, A.M., M.D., F.A.C.S.

THE MASTER SURGEON

AS A TOKEN OF FRIENDSHIP AND APPRECIATION
OF HIS SKILL, THIS BOOK IS
RESPECTFULLY INSCRIBED

PREFACE

The scope of this book is expressed in the title. The author has attempted to record some of the observations and practical experiences of a somewhat active service of forty years in emergency practice, the class of work where the attending physician is called on to think quickly and to act with rapidity and good judgment. Reference is also made to certain pathologic conditions, appendicitis, tubal rupture, acute pancreatitis, etc., emergency cases though distinctly surgical. The general practitioner should be familiar with the clinical symptoms of these conditions, the prompt recognition of which will not only tend to relieve him of personal responsibility, but will enable him to insist upon surgical assistance at a time most opportune to his patient.

Amputations, fractures, and dislocations are considered strictly from an emergency standpoint, or physician's first aid. Special forms of amputation and the more modern classical bone surgery are not alluded to, due to the many excellent textbooks on these subjects. The object of the author is to consider the common, unheralded, everyday accidents or emergencies that may and do arise to confront the general practitioner at a time when least expected. Definite information along this particular line is limited, not obtainable from textbooks, and certainly not available in time of great need; therefore the author feels that a work of this character devoted exclusively to this subject will prove of practical value and material assistance to many practitioners.

NATHAN CLARK MORSE.

Eldora, Iowa.

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CONTENTS

CHAPTER I

PRELIMINARY REMARKS, EMERGENCY INSTRUMENTS, EMPLOYMENT OF ADHESIVE PLASTER IN WOUND DRESSINGS

Preliminary Remarks, Emergency Instruments, Employment of Adhesive Plaster in Wound Dressings, 17; Asepsis, 21; Closure of Wounds, 23; Adhesive Plaster, 24.

CHAPTER II

REMOVAL OF FOREIGN BODIES

Foreign Bodies in the Nasal Passages, 28; Foreign Bodies in Pharynx, 30; Foreign Bodies in the Larynx and Trachea, 34; Foreign Bodies in the Ears, 42; Foreign Bodies in Urethra and Bladder, 44; Foreign Bodies in the Eye, 45; Foreign Bodies in the Rectum, 49; Foreign Bodies in the Stomach, 51.

CHAPTER III

TREATMENT OF ASPHYXIATION FROM DROWNING, SMOKE, GAS, ELECTRIC SHOCK. DESCRIPTION OF MECHANICAL DEVICES FOR ARTIFICIAL RESPIRATION

Drowning, 54; Mechanical Devices for Artificial Respiration, 61; Poisoning from Carbon Monoxide Gas, Illuminating Gas, etc., 74; Crile's Method of Direct Transfusion of Blood in Asphyxia from Gas and Smoke, 81; Resuscitation from Electric Shock, 82; Treatment of Electric Burns, 86; Lightning, 87; Suffocation, 88; Sewer Gas Poisoning, 90; Ammonia Gas Poisoning, 91.

CHAPTER IV

SURGICAL EMERGENCIES

Surgical Shock, 93; Wounds, 98; Nonpenetrating Wounds of the Abdominal Wall, 106; Abdominal Contusions with Injury to the Intestines, 106; Gunshot and Stab Wounds of the Lungs, 112; Gunshot and Stab Wounds of the Liver, 115; Nonpenetrating Wounds of the Liver, 117; Icterus, or Jaundice, 119; Penetrating Wounds of the Abdomen, 121; Penetrating Wounds of the Stomach, 125; Puncture Wounds of the Bladder, 126; Stab Wounds of the Neck, 127; Wounds of the Rectum and Anus, 130; Bruises and Sprains, 130.

CHAPTER V

SURGICAL EMERGENCIES (CONT'D)

Acute Appendicitis, 134; Peritonitis, 137; Tubal Rupture—Ectopic Gestation, 139; Strangulated Hernia, 143; Intestinal Obstruction, Intussusception, Volvulus, Meckel's Diverticulum, 145; Epistaxis, 147; Treatment of Wounds, 150; Scalp Wounds, 152; Wounds of Tongue, 154; Wounds of the Face and Lips, 155; Indentures of the Skull, 156; Tendons, 157; Injuries of the Knee, 158; Injuries of Scrotum, 163; Prolapsus Ani, 164; Paraphimosis, 165; Phimosis, 165; Puncture Wounds of the Uterus, 166; Puncture Wounds from Nails, Glass, Fishhooks, etc., 167; Injuries of the Ear, 169; Injuries to the Eyes from Mortar, Lime, Plaster, and Other Combinations of Lime and Sand Used for Building Purposes, 170; Removal of Gunpowder, Percussion Cap Particles, Torpedoes, etc., 171; Penetrating Cuts or Wounds of the Eye, 172; Injuries to the Eyelids, 173; Wounds of the Eyelids, 174.

CHAPTER VI

MEDICAL EMERGENCIES

Hemoptysis, 176; Diabetic Coma, 181; Cerebral Hemorrhage, or Apoplexy, 182; Angina Pectoris—Neuralgia of the Heart, 186; Acute Indigestion, 188; Intestinal Colic, 189; Renal Colic, 191; Biliary Colic, 192; Laryngitis Stridulosa, 193; Ophthalmia Neonatorum, 194; Hiccough, 196.

CHAPTER VII

MISCELLANEOUS EMERGENCIES—PARAFFIN METHOD OF TREATING BURNS

Ptomaine or Food Poisoning, 199; Ivy Poisoning, 207; Powder Burns or Stains, 208; Burns and Scalds from Fire, Gasoline, Kerosene, Steam, or Boiling Water, 209; Paraffin Method of Treating Burns, 214; Isolation, or Thermic, Fever, 218; Trichiniasis—Trichinosis, 223; Rabies—Hydrophobia, 224; Tetanus, 227; Convulsions of Children, 223; Exposure to Cold—Frost Bites, 235; Snake Bite, 237; Stings: Bee, Wasps, Hornets, Yellow Jacket, Scorpion, etc., 238; Bites of the Dog, Cat, Hog, Rat, Skunk, Weasel, and Other Animals, 241; Retention of Urine, 242; Extraction of Teeth, 244.

CHAPTER VIII

FRACTURES AND DISLOCATIONS

Fractures, 251; Ordinary Fractures and Their Treatment, 251; Fractures of the Skull, 256; Fracture of the Nose, 259; Fracture of the Malar, or Cheek, Bone, 261; Fracture of the Inferior Maxilla, 262; Fracture of the Scapula, 268; Fracture of the Clavicle, 270; Fractures of the Arm, 275; Fractures of the Radius and Ulna, 279; Fracture of the Olecranon Process of the Ulna, 289;

Fracture of the Ribs, 289; Fractures of the Femur, 291; Fracture of the Patella, 297; Fractures of the Tibia or Fibula, 298; Pott's Fracture of the Ankle, 305; Compound Fractures and Dislocations, 307; Dislocations, 309; Dislocations of the Inferior Maxilla, 309; Dislocation of the Clavicle, 310; Dislocation of the Humerus, 310; Simple Method of Reduction of Shoulder Dislocations, 312; Dislocation of the Elbow, 316; Dislocation of the Wrist, 317; Dislocation of the Fingers, 318; Dislocations of the Hip Joint, 319; Dislocations of the Knee Cap, or Patella, 322; Dislocations of the Knee Joint, 323; Dislocation of Ankle Joint, 324; Dislocation of the Cartilage of the Knee, 325; Dislocation of Tarsal Bones, 326.

CHAPTER IX

AMPUTATIONS

Amputations, 328; Time of Operation, 329; Method of Amputation, 329; Amputations of the Forearm, Arm, and Shoulder, 331; Amputation of the Wrist, 333; Amputation of the Fingers, 334; Buzz Saw Accidents, 335; Amputation of the Leg, 338; Amputation of the Thigh, 341; Amputations of the Hip, 343.

CHAPTER X

OBSTETRIC EMERGENCIES

Abortion, 346; Retention of the Placenta, 348; Cesarean Section, 350; Placenta Previa, 354; Mechanical or Forceps Delivery, 357; Inversion of the Uterus, 363; Postpartum Hemorrhage, 365; Uterine Hemorrhage in Young Girls, 367; Rupture of the Uterus, 367; Puerperal Eclampsia, 369; Prolapse or Presentation of the Umbilical Cord, 372.

CHAPTER XI

POISON FROM DRUGS USED AS MEDICINES

Poisoning from Acetanilide, Antifebrin, Antipyrine, or Phenacetin, 374; Poisoning from Aconite—Aconitine, 375; Aniline, 376; Alcoholic Poisoning, 377; Poisoning from Belladonna, or Atropine, Hyoscyamus, Hyoscyamine, Stramonium, Daturine, Dulcamara, Solanine, Duboisia, or Duboisine, 382; Poisoning from Bismuth Subnitrate, 383; Poisoning from Chloral Hydrate, 386; Poisoning from Calabar Bean, Physostigma, Physostigmin Sulphate, Eserine, 387; Poisoning from Cocaine, 387; Poisoning from Chloroform and Sulphuric Ether, 389; Poisoning from Croton Oil, 389; Poisoning from Digitalis—Digitalin (Foxglove), 391; Poisoning from Oil of Tansy, Oil of Savin, Oil of Pennyroyal, Oil of Dog Fennel, etc., 392; Poisoning from Opium, Laudanum, or Tincture Opium, Paregoric, Morphine Sulphate, Morphine Acetate, Codeine, Dionin, Heroin, Cannabis Indica, etc., 393; Poisoning from Aspidium, or Male Fern, 396; Poisoning from Phenol, or Carbolic Acid, 397; Lysol Poisoning, 400; Poisoning from Quinine, 400; Santonin Poisoning, 401; Poisoning

from Strychnine and Nux Vomica, 402; Poisoning from Salicylic Acid, Sodium Salicylate, Aspirin, Ammonium Salicylate, Strontium Salicylate, Salol, etc., 403; Poisoning from Sulphonal, Trional—Paraldehyde, 404; Poisoning from Veratrum Viride (American Hellebore), 405; Poisoning from Veronal, 406; Poisoning from Wormwood, Artemisia, Absinthium, 407.

CHAPTER XII

POISONING FROM ACIDS AND ALKALIES, AND ORDINARY POISONS

Preliminary Remarks, 408; Poisoning from Acids, 410; Burns from Acids, 412; Poisoning from Alkalies, 413; Poisoning from Antimony: Tartar-Emetic—Butter of Antimony, 415; Poisoning from Emetine Hydrochloride, 417; Poisoning from Arsenic, 418; Poisoning from Bromine, 422; Poisoning from Bromoform, 423; Poisoning from Castor Oil Beans or Seeds, 423; Poisoning from Copper—Blue Vitriol, Verdigris, etc., 424; Poisoning from Ink or Writing Fluid, 425; Poisoning from Indelible Ink., 426; Poisoning from Jequirity—Wild Licorice, 427; Poisoning from Kerosene—Coal Oil, 427; Poisoning by Mercury, 429; Poisoning from Calomel, 429; Poisoning from Corrosive Sublimate, 430; Poisoning from Oxalic Acid, 435; Tobacco Poisoning, 437; Poisoning from Wood Alcohol, 438; Poisoning from Formaldehyde, 441.

ILLUSTRATIONS

FIG.	PAGE
1. Leather grip for emergency outfit	19
2. Aseptic operating case	19
3. Applying sterile gauze to a wound of the forearm	22
4. Sterile dressings held in place by adhesive strips	22
5. Handy-Fold package. Gauze laid over wound	23
6. Actual sizes B & B dermal sutures	24
7. Insertion of skin suture	24
8. Method of applying a unilateral adhesive plaster support of the thorax, either for pleurisy or fixation of injured or fractured ribs	25
9. A very convenient and unique head bandage, reinforced by ZO plaster	26
10. Method of dressing boils, carbuncles, etc., on back of neck	26
11-12. Showing use of zinc oxide adhesive plaster	27
13. Noyes' alligator action forceps	29
14. Tyding's forceps	31
15-A. Luer's throat forceps, alligator action, opening anteroposteriorly	32
15-B. Fraenkel's plain throat forceps	32
16. Graefe's coin catcher	33
17. Ferguson's bristle probang	33
18. Trousseau's esophageal dilator	36
19. Faucher's soft rubber stomach tube with funnel end	36
20. Laryngoscope and mouth lamp	36
21. Tobold's throat forceps, with six attachments	37
22. Brophy's retractor	38
23. Weitlaner's retractor	38
24. Luer's tracheotomy tube	39
25. Laryngoscopic set	40
26. Modification of Killian's tracheoscope	41
27-28. Types of electric head lamps	42
29. Hartmann's ear forceps	43
30. Braasch's direct catheterization cystoscope	45
31. Taking a foreign body out of the eye	47
32. Wheeler's corneal curette	48
33. A popular method of dressing the eye after removal of foreign bodies	48
34. Polk's placenta forceps	50
35. Articles found in stomach of an insane patient	52
36. Author's method of removing water from the stomach and lungs	57
37. Illustrating the Sylvester method of artificial respiration	57
38. Sylvester method, second position, forcing the air from the lungs	59
39. Sylvester method of expelling fluid from stomach and lungs	59
40. Schäfer, or prone, method. Inflating the lungs	60

FIG.	PAGE
41. Schäfer's method of expelling the air from the lungs	60
42. Method of attaching oxygen generator to lungmotor	61
43. Lungmotor and oxygen generator in use	64
44. Oxygen generator of lungmotor	65
45. Showing throat tube in place in throat, and inflated to fit the throat	66
46. Tongue forceps shown on tongue, which is well drawn forward . .	67
47. The life motor	70
48. Draeger type of breathing apparatus	71
49. Mine rescue	73
50. Schäfer method of artificial respiration	84
51. Schäfer method of artificial respiration	85
52. Severe type of electric burn	86
53. Meinccke's hypodermoclysis apparatus	95
54. Meinccke drop attachment	96
55. Murphy-Magnuson's saline solution apparatus	97
56-57. Crushing injuries to feet sustained beneath car wheels	99
58. Carrel's apparatus for administering Dakin's solution	102
59. Gunshot wound of face—Carrel-Dakin method of treatment . . .	103
60. Gut resected	110
61. Murphy button dropped into end of gut	110
62. Lateral anastomosis with Murphy button	111
63. Gunshot wound of chest and arm	113
64. Illustrates a half spica retentive bandage for breast dressing follow- ing injuries of the chest or liver	114
65. Stab wound exposing a portion of the liver	116
66. Fatal stab wound of the neck	128
67. Temporary method of controlling hemorrhage from veins in the neck	128
68. Proper position for foot in applying Gibney dressing	131
69. Gibney ZO dressing complete	131
70. Appendicitis complicated by adhesions	135
71. Diseased appendix showing needle found therein	136
72. Ectopic pregnancy	140
73. Adhesions following ectopic gestation and rupture of tube	142
74. Curtis' nasal speculum	148
75. Convenient lamp condenser and mirror for nose and throat treatment	149
76. Student's lamp, for oil, adapted for condenser	149
77. Nasal gauze packer	150
78. Ordinary scalp wound prepared for suture	152
79. Recurrent bandage of the injured side of head	153
80. An excellent method of dressing scalp wounds	153
81. Fixed dressing of finger	157
82. A gunshot wound of the knee joint in a young man	159
83. Gunshot wound of the knee	159
84. Senn's method of draining an infected knee joint	161
85. Showing 38 caliber bullet in knee joint	161
86. Modified Cabot splint	162

FIG.	PAGE
87. Splinter forceps	168
88. Esmarch's tourniquet	168
89. Politzer's ear operating instruments	209
90. Extensive scald from bursting of steam pipe (before treatment)	210
91. Serious burns from gasoline, following explosion of stove	211
92. Extensive scald from steam	212
93. Freshly burned area	214
94. Douching the burn with Dakin's solution	216
95. Drying the wound with the electric hot-air drier	216
96. Paraffin atomizer	217
97. Application of paraffin with brush	217
98. Final dressing	217
99. Soft rubber catheter	243
100. McLean's male prostatic catheter	243
101. Dental forceps	245
102-103. Showing points for injection of anesthetic in gum	247
104. Root forceps	249
105. Method of correcting deformity in overriding fracture of sternum	252
106. The method shown in Fig. 105 has been supplemented by direct upward pressure on the inner ends of the clavicles with the finger tips	252
107-108. Fracture of the spine in the lower dorsal region	254
109. Depressed fracture of skull in left parietal region	257
110. Explosive effect of the modern high pressure missile at close range	257
111. Bullet in head	258
112. Pronounced swelling and ecchymosis of eyes following scalp wound	258
113-114. Old fracture of nasal bones with lateral displacement	260
115. Separation and angular displacement of lateral and septal cartilages	260
116. Fracture of nasal bones with displacement to right	260
117. Fracture of the posterior portion of the malar and the anterior end of the zygoma on the left side of the face	261
118. Dental splints	262
119. Fracture of mandible at symphysis	263
120. Fracture of lower jaw about twenty-four hours following injury	263
121. Fracture of lower jaw immediately following injury	264
122. Fracture of the right side of mandible about six weeks after injury	264
123. Four-tailed bandage made with adhesive plaster	265
124. Same as Fig. 123 with superfluous gauze cut away	265
125. Metal dental splint for cementing to the lower teeth	265
126. Same splint with the teeth in occlusion	266
127. Loops of wire passed about teeth of lower jaw preparatory to wiring the jaws together	266
128. Loops of wire passed about the upper teeth	266
129. Two points of fixation in wiring the maxilla together	266
130. Opposite side in same case showing line of fracture and two additional points of fixation	266

FIG.	PAGE
131. Simple method of wiring the upper to the lower teeth in fracture of the lower jaw	267
132. Fracture of superior maxilla	267
133. Grasping the body of the scapula to detect the presence of fracture .	268
134. Oblique strapping with adhesive plaster to immobilize body of scapula	269
135. Fracture of the right clavicle about twenty minutes after accident	270
136. Fracture of left clavicle about twenty-four hours following injury .	271
137. Fracture of the right clavicle with the usual symptoms	271
138. First strap of adhesive encircles the arm and then the body, pulling the arm backward	272
139. Second strap of adhesive passing down the posterior aspect of the arm, under the elbow and over the opposite shoulder	272
140. Third strap of adhesive which passes down the outer side of the arm, under the elbow and under the hand to the opposite shoulder	272
141. Another view of dressing showing attachment of straps posteriorly .	272
142-143. The C. F. Taylor brace which is particularly satisfactory in the treatment of fractures of the clavicle in children	273
144. First step in application of Sayre dressing. Circular pad to arm .	274
145. Second step in Sayre dressing. Arm pulled slightly backward . .	274
146. Third step in Sayre dressing	274
147. Finished Sayre dressing	274
148. Apparatus which may be used in fracture of upper end of humerus or clavicle	276
149. The Dupuy wire extension splint	276
150. Fracture of both bones of the forearm with the usual backward displacement of the hand	276
151-152. Fracture of both bones of the forearm with the usual deformity	277
153-154. Same case as shown in Fig. 152 after reduction has been accomplished and splints applied	278
155. Fracture of both bones of the forearm prior to reduction	278
156. Ventral splint applied following reduction and held in position by two straps of adhesive	279
157. Same dressing opened up for inspection during after-treatment .	279
158. Low fracture of surgical neck of right humerus	280
159. Same case (Fig. 158) seen in recumbent position	280
160. Cigar box boards cut to proper size to make diagonal axillary pad .	281
161. Plaster shoulder cap in position	281
162. Oblique fracture of humerus a little below its middle with overriding and angular displacement of the fragments	282
163. Transverse fracture of the lower end of the humerus	282
164. Same case as in Fig. 163 in sitting position	283
165-166. Compound comminuted fracture of lower end of humerus . . .	283
167. Levis' metallic splint	284
168. Simple Colles' fracture the result of a fall on the hand	284
169-170. Radial and ulnar views of recent Colles' fracture	284
171. Oblique Colles' fracture a few minutes following injury	285

FIG.	PAGE
172. Radial and ulnar views of Colles' fracture just before reduction	285
173-174. Two methods of grasping the wrist in reducing Colles' fracture	285
175. Emergency splint for Colles' fracture	286
176. Walker's splint for Colles' fracture	286
177. Severe compound fractures of the proximal phalanges of the fourth and fifth fingers	286
178. Plaster splint applied to thumb	287
179. Plaster splint applied to dorsal surface of middle finger and back of hand	287
180. Splint of cigar box wood padded, bandaged, and placed in position to immobilize middle finger	288
181. The finger splint padded and held in position by strips of adhesive	288
182. Adhesive plaster applied for fractured ribs	290
183. Shows adhesive plaster applied to the leg to secure longitudinal traction on the lower extremity. Buck's extension	292
184. Shows Buck's extension completed	292
185. Buck's extension	293
186. Turck's modification of Buck's extension	294
187. The ambulatory pneumatic splint with hip attachment	295
188. Dupuy's combination leg splint	296
189. Fracture of the patella	297
190. Fracture of upper end of tibia	298
191-192. Fracture of both bones of the leg near junction of lower and middle thirds, seen a few minutes after the accident and again four days later	299
193. Fracture box	299
194-195. Leg is seen in fracture box with proper padding in place and side of box let down for inspection and readjustment of dressing, and again with fracture box closed and fastened	300
196. Adhesive plaster applied for traction and countertraction with the short Desault splint	300
197. Short Desault splint in position, with padding about leg	300
198-199. Fracture of both bones of the leg just above the ankle	301
200-201. Fracture of both bones of the leg just above the ankle with pronounced inward displacement of the foot	302
202. Cabot posterior wire splint	303
203. Levis' metallic splint for tibia and fibula	303
204. Modified Cabot splint fracture of both legs	303
205. Pott's fracture of ankle	304
206. Shows the making and use of Dupuytren's splint for the treatment of Pott's fracture	304
207-208. Stimson's plaster splints applied to a Pott's fracture and held in position by strips of adhesive plaster	305
209-210. Simple Pott's fracture the result of a fall on the foot	306
211. Pott's fracture of the left ankle a few minutes following injury	306
212. Compound fracture of leg illustrating Carrel-Dakin irrigation	307

FIG.	PAGE
213. Compound fracture, great loss of superficial tissues, periosteum stripped free from tibia	308
214. Outlined x-ray of a low subcoracoid dislocation of shoulder . . .	312
215. Examining depression below the shoulder	313
216. Subglenoid dislocation of right shoulder	313
217. Same case. The head of the humerus lies between the two index fingers	313
218. Same case after luxation had been reduced	314
219. Posterior dislocation of right shoulder	314
220. Palpation of displaced head	314
221-222. Simple backward dislocation of the elbow about half an hour following the accident	315
223. Forward luxation of the head of radius	316
224. Dislocation of the wrist	317
225-226. Recent backward dislocation of the second phalanx of the middle finger the result of a twisting strain	318
227. Ventral dislocation of second knuckle	319
228. Backward dislocation of left index finger	319
229. Reduction of the common backward dislocation of the hip	320
230. Stimson's method of reducing posterior luxations	321
231. Preston's modification of Bigelow's method	321
232. Backward dislocation of left knee	323
233. Backward dislocation of ankle	324
234-235. Case of backward dislocation of the calcaneum and scaphoid on the astragalus	325
236. Forward dislocation of astragalus	326
237. Ideal incision for amputation of arm	332
238. Lines of incision for amputations of fingers and wrist	333
239. Amputation of thumb	334
240. Amputation of great toe	336
241. Lines of incision for amputation of all the toes	336
242. Amputation of ankle joint now rarely performed	338
243. Amputation at lower third of leg	339
244. Amputation of leg	340
245. Lines of incision for amputation of thigh and hips	342
246. Hip joint amputation. Pins and rubber tube tourniquet in position	344
247. Uterine packer	347
248. Incision for abdominal Cesarean section	351
249. Examination of fetus in abdominal Cesarean section	352
250. Closure of uterus in abdominal Cesarean section	352
251. The Morse forceps	362

EMERGENCIES OF A GENERAL PRACTICE

CHAPTER I

PRELIMINARY REMARKS, EMERGENCY INSTRUMENTS, EMPLOYMENT OF ADHESIVE PLASTER IN WOUND DRESSINGS

In emergency practice, success very frequently depends upon the possession of a variety of useful instruments, with which every practitioner should be provided and always have within easy access. Of the instruments which may properly be classed as indispensable may be mentioned: a good nasal speculum, alligator forceps, a number of good hemostats, a curved throat or laryngeal forceps, vulsella and dressing forceps, stomach tube, bristle probang, a good head-band mirror with electric light or pocket flashlight, and other like instruments.

There are, however, a vast number of specially constructed novel and costly instruments, which in rare or selected cases, might be used to advantage; but such instruments, seldom required, occupy too much space and hence the practitioner who can accustom himself to the employment of the more simple, common everyday useful tools will possess a distinctive advantage over the man who depends upon a number of special instruments, not always possible to obtain.

The best instruments are now constructed entirely of steel, or steel and aluminum, in order to permit their being sterilized more readily by boiling. All scissors, forceps, and other like instruments should be held together by screws, or properly riveted, since all forms of mortice or loose locks sometimes permit the blades to fall apart when hurriedly grasped or held by one blade.

In these days of preparedness, a good emergency grip is synonymous with having good reliable ammunition at hand and our

forces organized for offense and defense. Every practitioner, more especially those who reside in rural districts or small towns, should be provided with emergency cases or grips which, when kept in proper condition, are always a source of satisfaction, not only to the practitioner himself, but the public soon learns to appreciate the fact that certain doctors are always prepared to respond promptly, to meet any kind of an emergency.

For a number of years, the author has kept three leather grips or emergency outfits within easy access and has found these less cumbersome and much more convenient than to attempt to carry all that is needed in one satchel. The larger bag is similar to those supplied by all instrument houses, constructed of good leather, with solution trays, etc., and is intended to be taken in responding to major cases, railroad injuries, and other like accidents. This grip (Fig. 1) contains the following:

- ½ lb. roll sterilized cotton.
- 2 yds. sterilized gauze, 1-yard packages.
- 1 spool ZO adhesive plaster, 2-inch.
- 1 spool ZO adhesive plaster, 1-inch.
- 4 roller bandages, 3-inch.
- 4 roller bandages, 2-inch.
- 2 roller bandages, 1-inch.
- 1 card braided silk, 3 sizes.
- 1 pkg. catgut ligatures, in bottle.
- 25 silkworm-gut ligatures, in bottle.
- 1 pkg. parresine with brush.
- 2 doz. gauze sponges.
- 1 oz. antiseptic dusting box.
- 50 chlorazene tablets.
- 2 oz. 95% carbolic acid in screw-cap bottle.
- 2 oz. chloroform in screw-cap bottle.
- 8 oz. sulphuric ether in screw-cap bottle.
- 4 oz. styptic cotton.
- 1 bottle drainage tubes, assorted sizes.
- 1 doz. assorted needles in case.
- 1 lot safety pins.
- 1 good quality razor.
- 1 bandage scissors.
- 1 tube antiseptic soap.
- 1 Esmarch tourniquet.
- 1 aspirating hypodermic syringe.
- 1 fountain syringe.
- 1 aseptic operating case (Fig. 2).

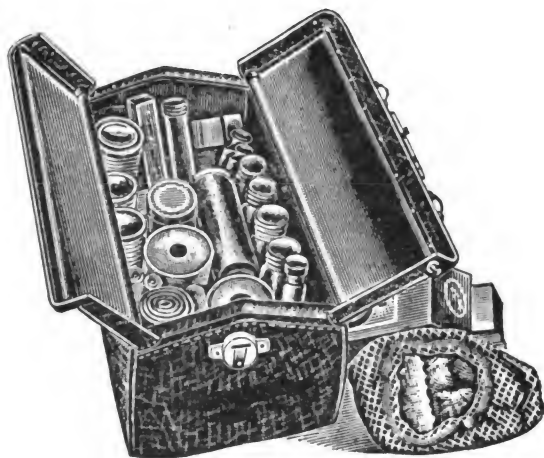


Fig. 1.—Catheter grip for emergency outfit.



Fig. 2.—Aseptic operating case.

The second case, which is much smaller and more convenient to carry, contains the following:

- ½ doz. tincture iodine ampules.
- 1 nasal speculum.
- 2 alligator straight and curved forceps.
- 1 four pronged tenaculum or vulsellum forceps.
- 1 tongue forceps.
- 6 hemostats.
- 2 scalpels.
- 1 esophageal bristle probang.
- 1 stomach tube.
- 1 tonsil hemostat.
- 1 nasal gauze packer.
- ½ doz. soft catheters.
- 1 aspirating hypodermic syringe.
- 6 wooden tongue depressors.
- 1 pair dressing scissors.
- 1 tourniquet.
- 2 spools 1-inch and 2-inch ZO adhesive plaster.
- 1 pocket flashlight.
- ½ doz. 2½-inch rolled bandages.
- 1 pkg. absorbent cotton.
- 2 yds. moist sterile gauze.
- 1 pocket surgical case—needles, etc.
- ½ doz. assorted sizes catgut sutures, plain and chromic.
- 1 tube sterile lubricant.

The third grip contains the following:

- 2 stomach-tubes, large and small.
- 1 fountain syringe.
- 1 curved dressing forceps.
- 1 straight scissors.
- ½-lb. roll cotton.
- ½ lb. alcohol.
- ½ doz. ampules sulphuric ether.
- ½ doz. ampules camphor oil.
- 1 large hypodermic syringe.
- 8 oz. whisky—metal-covered bottle.
- 4 oz. chloroform.
- 1 mouth speculum.
- 1 case containing 6 one-ounce glass-stoppered bottles containing:
 - aromatic spirits of ammonia.
 - sulphuric ether.
 - sol. sodium chloride iron.

- 1 small hypodermic surgical case containing:
 - hypodermic tablets: apomorphine, $\frac{1}{10}$ gr.;
 - morphine sulphate, $\frac{1}{4}$ gr. with atropine,
 - $\frac{1}{150}$ gr.; strychnine nitrate, $\frac{1}{30}$ gr.
- $\frac{1}{2}$ lb. parresine and brush.
- 3-yd. roll sterile gauze.
- 2-oz. tube oxide zinc ointment.
- 2 spools 1-inch and $2\frac{1}{2}$ -inch ZO adhesive plaster.
- $\frac{1}{2}$ doz. $2\frac{1}{2}$ -inch rolled bandages.
- 1 doz. Handy-Fold Package picric acid gauze, B&B.

ASEPSIS

The wonderful advancement in modern surgery, the alleviation of pain and prompt healing of wounds without serious infection is now justly attributed to surgical cleanliness, or asepsis; therefore, the treatment of all cuts, open wounds of whatsoever kind and nature, whether treated at a hospital or private home, demands that the closest attention be paid to the modern rules of surgical asepsis and it is likewise fully established that the physician who first assumes charge of the case, or the person who administers first aid, very often holds within his hands the question of infection or noninfection of the patient.

The forbearance of any unnecessary handling or prolonged examination of the open wound or involved tissue, however tempting to the novice, is now insisted on, and modern surgery demands that the fingers, however supposedly sterile, or even sterile gauze, must not, under any circumstances, be thrust into a wound, since removal of any foreign substance is best and more safely accomplished by means of sterile instruments. The former custom of scrubbing the skin with a stiff brush, and even the wound itself, using an abundance of soap and water, is now considered obsolete and uncalled for; at most, in foul or greasy wounds the adjacent skin may be gently swabbed with a strip of gauze saturated with a little ether or gasoline. The wound itself, having been kept as dry as possible, is next treated by pouring upon and into every accessible part thereof, a 5 per cent freshly prepared solution of tincture of iodine, or one of the more recent chloramide solutions may be used to advantage.

The wound is then brought together by proper suture or sterile zinc oxide adhesive strips, over which is placed an abundance

of dry sterile dressings, held finally by a roller bandage or adhesive strips. (Figs. 3 and 4.)

The average general practitioner is poorly equipped for good aseptic detail work even in minor surgery. Many surgical cases are sometimes unavoidably compelled to return from the hospital



Fig. 3.—Applying sterile gauze to a wound of the forearm.



Fig. 4.—Sterile dressings held in place by adhesive strips.

to their homes with partially closed operative wounds, to become later infected from lack of proper aseptic dressings or carelessness in detail work, which operate to the detriment of the wound healing. To better prepare the practitioner for successfully treat-

ing this class of cases, certain manufacturers placed on the market small packages of dressings particularly suited to this class of cases.

Fig. 5 illustrates B & B's Handy-Fold package and method of its proper application. Each dressing is wrapped in a separate parchine paper envelope and sterilized after sealing. The dressings may be made larger or smaller by the simple process of folding or opening the gauze and thereby fitted to apply to any size wound or any part of the body.



Fig. 5.—Note Handy-Fold package. Gauze laid over wound, having been touched only by sterile forceps.

CLOSURE OF SKIN WOUNDS

Widely gapping skin wounds of the face, neck, or other exposed parts are best closed by means of subcutaneous suture or possibly oxide of zinc adhesive plaster. Of the various materials, such as silk, silkworm-gut, chromic catgut, horsehair, or linen, horsehair has been most commonly accepted for skin suture; but it is very difficult to sterilize and the individual strands lack uniformity in diameter, are short and lacking in tensile strength, so much so that the cut edges of a long incision can not be held in close apposition. Catgut is not a good skin suture, since it is irritating to many sensitive skins; and in the process of its early

absorption, seems to invite infection. Recently the author has tried with satisfaction, a new dermal suture, prepared by a chemical process from silk, introduced by Bauer and Black, and colored by pyoktanin, which in physical appearance closely resembles horsehair. These dermal sutures possess the advantage of length, strength and uniformity in diameter. They are supplied in three sizes and 40 inches in length.

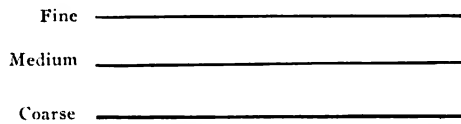


Fig. 6.—Actual Sizes B & B Dermal Sutures.

Fig. 7 illustrates the method of insertion of the subdermal suture. When the skin is closed, the suture having been drawn fairly taut, is knotted upon itself and may be removed at the proper time by clipping one of the knots and withdrawing the suture from the opposite end. Michel's metal skin clips are very

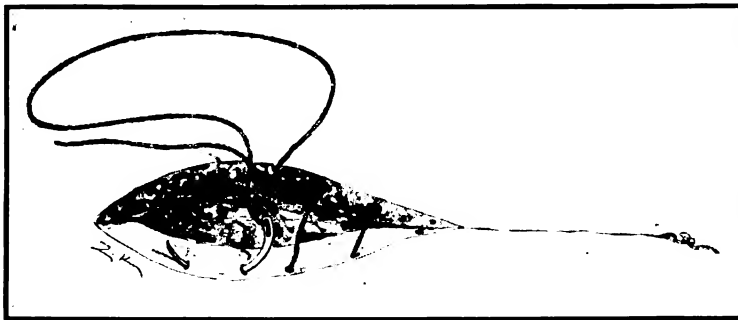


Fig. 7.—Insertion of skin suture.

popular and serve a good purpose, but their field of usefulness should be confined to the closure of hernia incisions or small abdominal wounds where there is little or no tension.

ADHESIVE PLASTER

Since the elimination of all irritating substances from surgeons' adhesive plaster, by the employment of, or addition of oxide of zinc, which enables the plaster to be rendered sterile, and since

the new plaster is so quickly adhesive and will not slip, its employment has become quite popular, not only where it is specially indicated, but it is employed in conjunction with almost every variety of surgical appliance. In plastic surgery of the face, or where the dressings held in place require constant changes, as in many eye cases, Holland Tape is much to be preferred. This tape, supplied in rolls of forty-five feet from one to four inches in



Fig. 8.—Method of applying a unilateral adhesive plaster support of the thorax, either for pleurisy or fixation of injured or fractured ribs. Three strips of 3-inch adhesive are used, the underlying strip being overlapped equally by the other two to insure equality of compression at all points and applied snugly during forcible expiration of the air from the chest.

width, has upon one surface, a very thick layer of gum arabic paste. When required for use, small strips are cut therefrom, and after being placed in sterile water for a moment, are ready for use. They dry quickly and hold firmly and all that is necessary to do to remove them is to apply a little sterile water by means of a pipette or moistened piece of gauze or cotton. Long con-

sidered as a valuable adjunct in the treatment of fractures of the femur, as in Buck's extension, etc., adhesive plaster, properly applied, is now also considered indispensable where a limitation of motion or movement of the parts involved is necessary and especially where a certain amount of support or compression is also desirable. Its employment, therefore, is now highly extolled in cases of pleurisy, sprains of the ankle or knee joint, arthritis, synovitis, orchitis, epididymitis, etc., as well as in the treatment of



Fig. 9.



Fig. 10.

Fig. 9.—A very convenient and unique head bandage, reinforced by ZO plaster. It may be applied without the assistance of a second party, and will hold any head dressing firmly in place as long as is desired.

Fig. 10.—A very convenient method of dressing boils, carbuncles, etc., on the back of the neck. To change dressings, cut center of adhesive strips, apply fresh gauze and re-fasten with small adhesive strips.

fractures of the clavicle, lower end of the humerus, metacarpal bones, fingers, patella, and ribs.

In the coaptation of cuts or skin wounds or to relieve tension after sutures have been inserted, the application of specially sterilized strips of oxide of zinc plaster are very efficient, and where the stitches following a laparotomy have been removed, it is our custom to apply these strips to aid in the support and pre-

vent widening of the scar tissue. Small strips of adhesive plaster are preferable to safety pins for holding or fixing the ends of a bandage and a great many surgeons now rely upon strips of adhesive plaster for the retention of dressings, or fixation of bandages.



Fig. 11.



Fig. 12.

Figs. 11 and 12.—Showing use of zinc oxide adhesive plaster.

Technic in Using Adhesive Plaster

The skin must be carefully cleansed with soap and water, followed by alcohol, the skin shaved and all hair removed, lastly the parts are bathed slightly with sulphuric ether and allowed to dry from evaporation. Later, to remove the strips, saturate a small piece of gauze with gasoline, benzene, or ether, loosen and turn up the edge of the plaster and allow the gasoline or ether to drip between the face of the plaster and the skin. It will respond readily to a gentle pull.

Figs. 8 to 12 also serve to demonstrate the important field of usefulness for zinc oxide adhesive plaster in emergency cases.

CHAPTER II

REMOVAL OF FOREIGN BODIES

FOREIGN BODIES IN THE NASAL PASSAGES

An accident common to children is the placing of foreign bodies in the nasal cavity. Every physician meets with trials or annoyances of this character; leaves, flowers, buttons, corn, beans, bullets, pebbles, and other articles too numerous to mention have been removed from the nasal cavities of children, and leeches, bugs, and insects have been known to crawl in and inhabit the posterior nares of children, causing local inflammation, with more or less fetid discharges, often diagnosed as chronic catarrh. The insertion of a foreign body in the nose is usually made known to the parents, but very frequently they are unknown or forgotten, and the object remains to become impacted, and by its presence keeps up more or less soreness, irritation, and offensive discharge.

Diagnosis

It is the duty of every physician consulted regarding a chronic discharge from the nose of a child, and especially where there is an apparent unilateral obstruction to respiration, to make a thorough examination with a good artificial light and nasal speculum, and if no obstruction can be seen or found in the anterior nares, the posterior nares should also be inspected before attributing the cause of the discharges to adenoids or enlarged tonsils. The author recalls an instance where a child of three years was forced to undergo a tonsillectomy and soon afterward an operation for the removal of adenoids without apparent relief from a chronic purulent nasal discharge. Later a careful inspection of the nares revealed an empty BB cartridge impacted in the nasal cavity, which had caused ulceration and sloughing. Its removal was followed by a prompt recovery.

Treatment

If the foreign body is favorably located with the aid of a good light and nasal speculum and a small pair of alligator forceps, (Fig. 13) curette, or spud, it is often a simple matter to remove the object, but frequently, with parents or friends as assistants, in their endeavors to hold and control a frightened and resisting child of three or four years the mechanical ingenuity of the surgeon will be put to a very severe test, not only to remove the foreign body, but prevent injury to the tissues. The struggling child will very often draw the obstructing body farther and far-

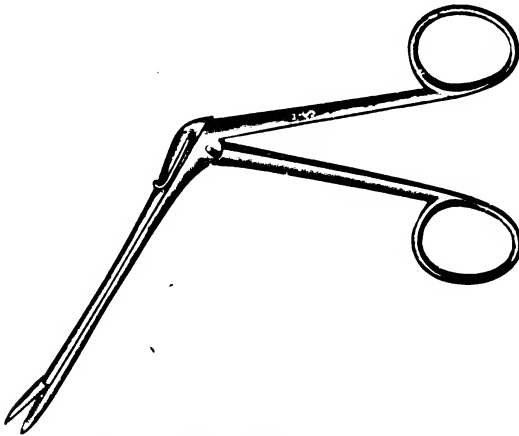


Fig. 13.—Noyes' alligator action forceps.

ther back in the nasal cavity, which only tends to complicate matters. It is a good plan always to precede the examination of the nasal cavity with a cocaine spray, and where a preliminary examination fails to locate the foreign body, it is better and safer to administer a general anesthetic before attempting any prolonged method of examination or removal.

It is not good surgery to attempt to force the foreign substance back into the pharynx, trusting the patient to eject or swallow it, nor is it ever advisable or necessary to resort to the old-time method of tickling the nose with a feather or to the use of snuff, nor is it safe to employ the anterior nasal irrigation—front-backward—or Thudichum douche passing through the opposite nostril. The best and safest plan where the object can not be seen

and reached from the front is to pass a No. 14 or No. 16 soft rubber catheter through the mouth, back and up through the posterior nares. This can be quickly done, after fixation with a suitable mouth speculum, with the aid of the finger inserted into the mouth and used as a guide. By this means the foreign body can be pushed forwards and out of the nose. This method rarely fails, but should the catheter pass by or fail to push the object out, the catheter should be withdrawn until the tip is back of the obstruction; then by the means of a bulb syringe, the point of which has been inserted into the open end of the catheter, a strong stream of water can be thrown forward into and out of the nose, the assistant holding the child's head downward and forward so it will assist in forcing the substance out of the nose. Should this method fail, which it rarely does, remove the syringe and by means of a good, stout ligature, tie or sew to the open end of the catheter a strip of sterile gauze sufficiently large to fill the nasal cavity, and by drawing the catheter out of the nose, the gauze will follow and thus remove any obstruction loosely located therein.

Where foreign bodies remain for a long time impacted and incysted in the nares, it has sometimes been found necessary to make an external incision to accomplish their removal.

FOREIGN BODIES IN PHARYNX

Choking

During the act of masticating food or holding objects in the mouth while laughing or taking a deep inspiration, foreign bodies are sometimes drawn into and lodged in the pharynx, causing more or less asphyxia or distress, dependent on the size, shape, character, and location of the obstruction. Substances such as a large bolus of meat, coins, etc., usually lodge just below the glottis, or pressing thereon, and by such pressure may cause death by apnea before relief can be obtained. Smaller articles, such as pins, needles, fish bones, gristle, etc., as a rule lodge transversely and stick to the tissues back of the tonsils or posterior walls of the pharynx, and still smaller things, such as tacks, buttons, fruit seeds, etc., generally slip into the glossoepiglottic fossa or into the pyriform sinuses (Sajous). In other instances coins, false

teeth, large pieces of gristle or other light substances too large to swallow lodge in the lower part of the pharynx or upper part of the esophagus opposite the cricoid cartilage, where they cause distress or pain, although respiration may not be seriously interfered with. Lastly, it is not uncommon for children, while holding in their mouths sharp or pointed objects such as a pencil, crochet needle, fork or some such article, to fall suddenly and thereby force the object back into the tissues of the throat, not infrequently causing severe laceration or excessive hemorrhage from the puncture of an artery, or the spinal canal may even be penetrated at the base of the cranium.

Hemorrhage from the throat as a result of a puncture by a

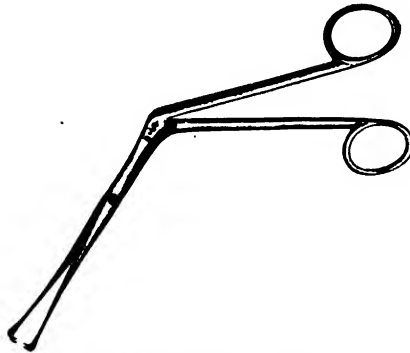


Fig. 14.—Tyding's forceps.

pencil or other sharp object should be carefully located, and the bleeding point seized by a double tenaculum forcep (Fig. 14) to be controlled later by the insertion of a mattress suture. If the hemorrhage is near or at the tonsil, the compression forceps may be used to great advantage.

When called to relieve an individual apparently badly choked, the physician should immediately make a digital examination of the throat by thrusting the finger well into the pharynx. The offending object may often be hooked, pushed, or dislodged from its position sufficiently to temporarily relieve the asphyxia, and if the obstruction is not readily removed, the position, character, or nature of the offending body can best be determined by means of the tip of the finger, and with the finger as a guide, a suitably

curved throat forceps may rapidly be passed along the palmar surface of the finger and be made to grasp the object and effect its withdrawal. (Fig. 15.) If the object can not be easily withdrawn and proves to be a bolus of food, piece of meat or other digestible substance, it may be pushed down into the esophagus and on into the stomach.

The author recalls an interesting case demonstrating this method of treatment. An elderly man became choked in an attempt to swallow a piece of "spare rib." Various attempts were

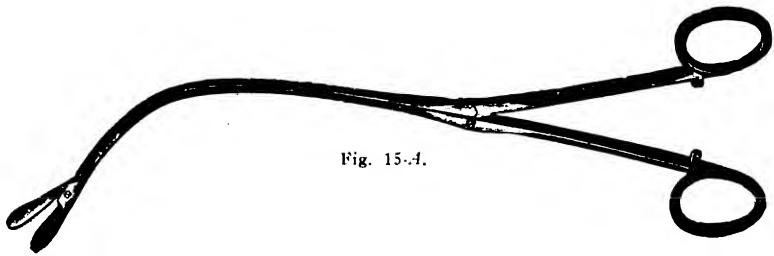


Fig. 15-A.

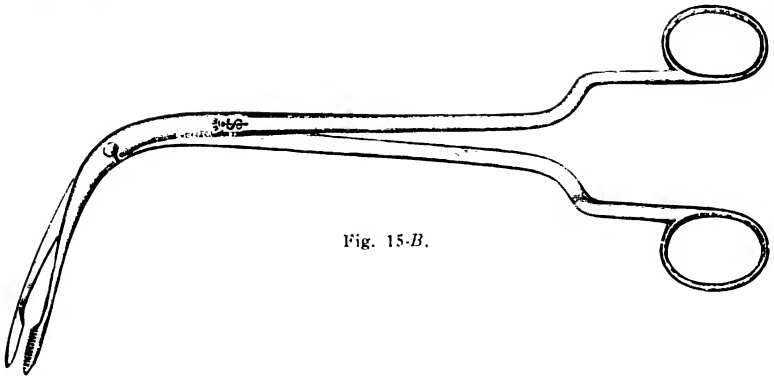


Fig. 15-B.

Fig. 15-A.—Luer's throat forceps, alligator action, opening anteroposteriorly.
Fig. 15-B.—Fraenkel's plain throat forceps.

made by his attending physician to remove the obstruction by means of forceps, curette, etc., without success. The man was then brought to the hospital by carriage, a distance of twenty-five miles, for a supposedly necessary esophagotomy. On arrival the patient was much exhausted, with pain and distress apparent in every feature; a bloody, frothy mucus exuded from his mouth, and in his efforts at respiration he made a peculiar croaking noise distinctly audible for some distance, although cyanosis

was not marked. A soft mass could be felt with tip of index finger, and easily pushed down sufficiently to relieve his embarrassed breathing. A flexible stomach or lavage tube was then inserted and by this means the object was quickly pushed into the stomach, affording instant relief and demonstrating the uselessness of attempting to withdraw such objects through the mouth.

On the other hand, it is not good surgery to force or push such articles as artificial teeth, keys, very large buttons or coins,

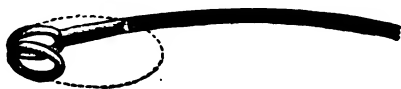


Fig. 16.—Graefe's coin catcher.

lodged in the pharynx, down into the stomach, where, by their presence they may cause obstruction or serious local lesions, or, later, lead to a more serious operation to the patient. In cases of this character the object should be dislodged with the tip of the finger only sufficiently to relieve the asphyxia; or, in cases where respiration is not seriously embarrassed, they may be definitely located and removed under the x-ray, or by means of the laryngoscopic mirror and forceps, with local anesthesia.

Where these methods fail, the location and removal of the foreign body should be determined with the aid of the esophagoscope, which, in skilled hands, is a safe procedure, and frequently



Fig. 17.—Ferguson's bristle probang.

avoids the necessity of the more serious operation of esophagotomy or gastrotomy.

Sharp articles which do not embarrass respiration, such as pins, needles, bits of toothpicks, bristles, or fish bones, etc., are best located and removed with a good light, head mirror, and curved throat forceps or curette. The bougie brush is often of great value (Fig. 17), and may be resorted to in cases where the objects have not been detected by ocular inspection. It must not be forgotten that any slight puncture or abrasion of the tissues of the pharynx

or tonsil may produce the sensation of a foreign body and may remain several days after the object has been removed. This should be explained to the patient, and if not satisfied, the spots on local points of irritation may be touched with nitrate of silver in order to hasten relief.

FOREIGN BODIES IN THE LARYNX AND TRACHEA

Foreign bodies are frequently drawn into the larynx and trachea during laughter or sudden inspiration, while holding the object in the mouth. Children are especially liable to this accident, since they invariably make their mouths the common receptacle for everything small enough to be held in them. Medical literature is, therefore, replete with numerous instances of the history and difficult removal of such things as pins, needles, tacks, toys or parts of toys, screws, pebbles, rings, buttons, beans, coins, candy, and fruit seeds, that had become lodged in the larynx, trachea, or bronchi of children. Among novelty cases may be mentioned one by Dr. Samuel Johnson, who reported a case of the removal of a toy locomotive from the subglottic cavity of a child, by means of tracheotomy and thyrotomy.* But children do not have a monopoly of this accident, and to the above list of foreign substances drawn into the larynx and trachea of grown people may be added artificial teeth, collar buttons, coins, breast-pins, and articles of food during mastication.

Symptoms

When a foreign body is drawn into the larynx, it provokes immediate and violent efforts of expulsion. If the foreign substance is not immediately dislodged and thrown out, pain and symptoms of asphyxia or suffocation rapidly follow. The distress is often pitiable, and depends somewhat upon the amount of mechanical occlusion and spasmodic action of the muscles of the larynx.

The symptoms of this accident are graphically described by the late Prof. Gross (quoted by Cohen and Sajous), as follows: "The patient is seized with a feeling of annihilation; he gasps

*Arch. Clin. Surgery, Dec., 1876.

for breath, looks wildly around him, coughs violently, and almost loses his consciousness. His countenance immediately becomes livid, the eyes protrude from their sockets, the body is contorted in every possible manner, and froth and sometimes even blood, issue from the mouth and nose. Sometimes he grasps his throat, and utters the most distressing cries. The action of the heart is greatly disturbed and not infrequently the individual falls down in a state of insensibility, unable to execute a single voluntary function. In short, he is like one who has been choked by the hand or by the rope of the executioner. Sometimes a disposition to vomit or actual vomiting occurs immediately after the accident, especially if it takes place soon after a hearty meal. The relief occasionally experienced from this source is very great. The duration of the first paroxysms varies from a few seconds to several minutes, or in severe cases, as when the foreign body is arrested in the larynx, even to several hours. With the restoration of the respiration, the features resume their natural appearance, and the patient recovers consciousness and power of speech. The voice, however, frequently remains somewhat altered, the breathing is more or less embarrassed, and the individual is harassed with frequent paroxysms of coughing, attended often with a recurrence of all, or nearly all, the original symptoms. Thus the case may progress for an indefinite period, until the foreign body is expelled, or until it produces death by functional or organic disease of the air passages."

Occasionally, if the foreign body is smooth or hard, such as a bullet, tooth, button, or kernel of corn, it may pass or be drawn rapidly into the bronchi, and the primary symptoms may possibly be slight, or pass away quickly, to be followed in a few days with more or less inflammatory and exudative symptoms, with later the physical signs of bronchopneumonia, abscess, or gangrene, which may, and often does, terminate fatally. There are a number of cases on record, however, where foreign bodies have remained in the bronchi and larynx indefinitely without injury, but they are reported only as unusual, nor would it be considered safe to permit a foreign body to remain without making every reasonable effort to remove it.

Diagnosis

The diagnosis of a foreign body in the air passages, when we have a direct history of sudden onset with marked strangulation and other symptoms of acute asphyxia, is comparatively a simple matter, but when the individual is found unconscious and death seems impending, we can usually form an opinion of acute ob-



Fig. 18.—Trousseau's esophageal dilator.

struction to respiration from the presence of cyanosis, the distorted features, and general appearance and actions of the patient.

A digital examination rapidly made or the employment of an esophageal bougie (Fig. 18) or stomach-tube (Fig. 19) will disclose whether or not the obstruction is within the pharynx or esophagus,



Fig. 19.—Faucher's soft rubber stomach tube with funnel end.

or whether or not the object is located in the supra- or infra-glottic portion of the larynx. Valuable information can often be obtained by means of the finger alone, not only to determine the location or position of the foreign body, but also the proper instruments for its removal, and an emergency tracheotomy may

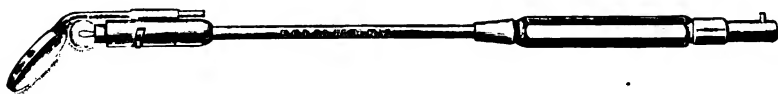


Fig. 20.—Laryngoscope and mouth lamp. Various mirrors are interchangeable and the distance between mirror and lamp can be varied at will.

thus be avoided. When the foreign body has been drawn into the trachea or passed down and lodged in one of the bronchi, and the acute symptoms of suffocation dependent thereon have ceased, direct inspection by means of the electric laryngoscope (Fig. 20) or the more modern tracheoscope (Killian), or the employment of the

roentgen rays will materially assist in determining the character and exact location of the offending foreign substance, provided always, that the foreign object is of such a nature or substance as to be rendered visible by means of the x-ray.



Fig. 21.—Tobold's throat forceps, with six attachments.

Prognosis

When a foreign body becomes lodged at or within the glottis or drawn into the trachea, death from asphyxia may take place very suddenly. The prognosis in this class of cases must, therefore, depend upon the possibility of prompt relief and the general condition or vitality of the patient. When the acute symptoms have passed without the expulsion of the foreign body, the prognosis is always grave so long as the foreign body remains within the air passages, the chief source of danger being local or general infection, with ultimate danger of abscess, septic pneumonia, or gangrene; and although instances are not uncommon where foreign bodies have remained within the trachea or bronchial tubes for months and years without apparent injury, nevertheless, the inflammatory results induced by their presence are so frequently fatal that every reasonable effort should be made to effect their prompt removal.

Treatment

In acute cases where the danger of asphyxia is apparent, a rapid digital examination should always be made of the fauces, pharynx, posterior nares, and especially the epiglottis. This will not only tend to remove or clear away any obstructive substance located therein, but will tend to cause vomiting and voluntary ex-

pulsion of the offending substance, or if the object can be felt or located with the finger, it can then be seized with a pair of laryngeal forceps (Fig. 21), and safely extracted through the mouth.

Should these simple methods fail and the patient become asphyxiated, tracheotomy should be performed at once as an emergency measure.

Tracheotomy Technic

Usually no anesthetic is needed if the asphyxia is marked. The patient should be placed upon his back upon a table, with shoulders slightly elevated and head drawn backwards, in order that

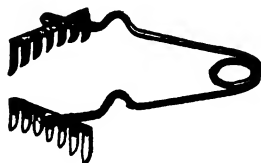


Fig. 22.—Brophy's retractor.

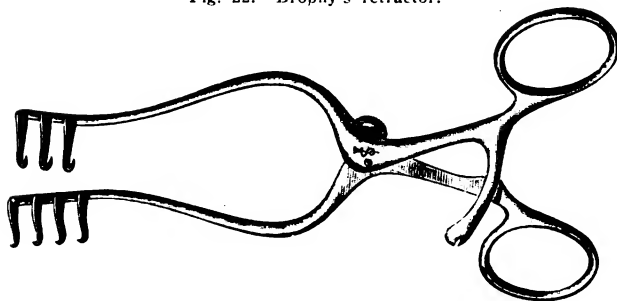


Fig. 23.—Weitlaner's retractor.

the tissues of the neck may be well extended; the head must then be held in the median position.

An incision one and one-half to two inches in length in the adult, and one to one and one-half inches in children, should be made through the skin and subcutaneous fat directly over the trachea in the median line, avoiding any vein that is noticeable when the skin is retracted. The tissues may now be separated rapidly with the handle of the scalpel until the space between the sternohyoid muscles is revealed.

A self-retaining tracheal retractor forceps (Figs. 22 and 23), may

now be used to great advantage, and after the hooks are inserted and tissues retracted, the thyroid isthmus comes readily into view. The fascia which binds the thymus to the trachea should be transversely divided, laying bare the upper tracheal ring. With the handle of the scalpel the surgeon exposes three or four rings. The trachea should now be firmly and securely fixed with the tenaculum and held by an assistant. The trachea is then opened between the forceps at least through two or three rings. In a great majority of cases the coughing and violent expulsive efforts always manifest on opening the trachea, are sufficient to expel the foreign body. It may be ejected through the wound or thrown up through the glottis into the mouth. If the foreign body is not expelled, the patient may be turned upon the face, or even in-



Fig. 24.—Luer's tracheotomy tube.

verted for a few moments, but efforts at extraction should not be prolonged at this time. If the object can not now be found by inspection in the open incision, it is better surgery to keep the wound open by placing ligatures through the edges of the tracheal incision and tying them around the neck or a tracheotomy tube may be inserted, the wound being dressed in the open method. The patient should be placed under a canopy of bed clothing, or in a warm apartment with continuous attendance, and allowed to rest until his normal strength and vigor returns, thus giving the attendant sufficient time to prepare for and determine the best method of further procedure.

Laryngologists have become in recent years exceedingly expert in the successful removal of foreign bodies from the larynx and trachea, as well as the bronchi, and the older methods, considered

scientific in their day, of the use of curved forceps, probes, hooks, etc., are now considered obsolete, dangerous, and especially liable to carry septic infection. A good radiogram is of very great value, provided it reveals the object sought; otherwise it is valueless or deceptive. The most popular of modern methods for the removal of foreign bodies from the air passages is that of Killian, of Freiburg, Germany. In 1897 he devised a tracheal tube to be

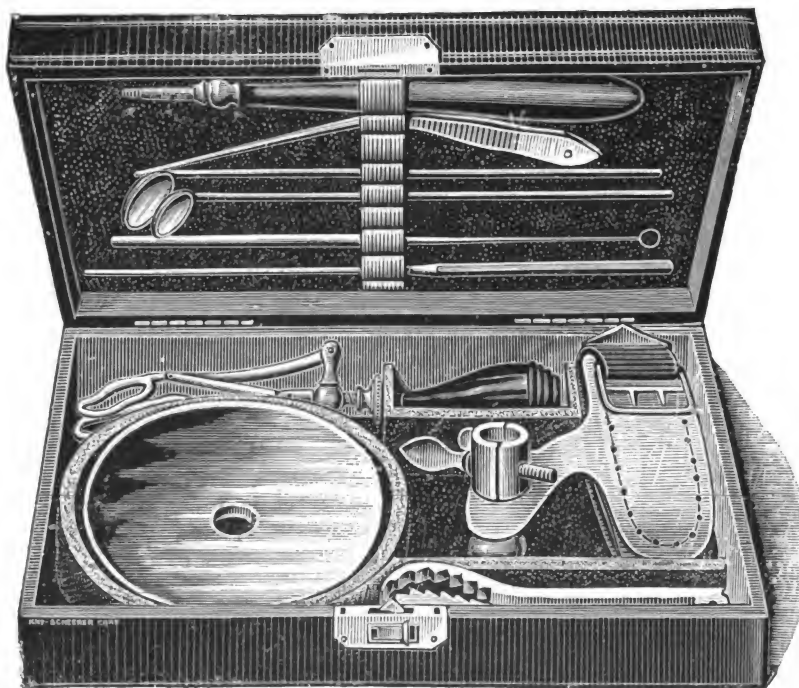


Fig. 25.—Laryngoscopic set.

used with a Kierstein autoscope following tracheotomy, by means of which, after passing the tube through the tracheal incision, he could watch the procedure, push, guide, or direct the tube into the bronchi until it came in contact with the foreign body, then by means of specially constructed forceps, made to pass through the tube, he could grasp and remove the object sought. This he called his *low operation*.

Later, Killian introduced what he terms the *higher method* of

removal, or *upper direct tracheoscopy*, by means of which he has found it possible to inspect and locate foreign bodies within the trachea or bronchial tubes without the necessity of a preliminary tracheotomy. He also devised what he calls *Killian's phantom* to enable anyone to become proficient with his method.

Tracheoscopy is performed usually with local anesthesia. Killian lays particular stress on the necessity of thoroughly cocainizing the left pyriform sinus and the posterior cervical region, recommending a 25 per cent solution therefor. Where the patient is a child or the individual is particularly nervous, and especially if the bronchial tubes are to be penetrated, general anesthesia is essential. W. C. Morton, of New York, and Algernon Coolidge, of Boston, have adopted modifications of Killian's method, with various improvements upon his instruments, the essential principles, however, remaining unaltered.

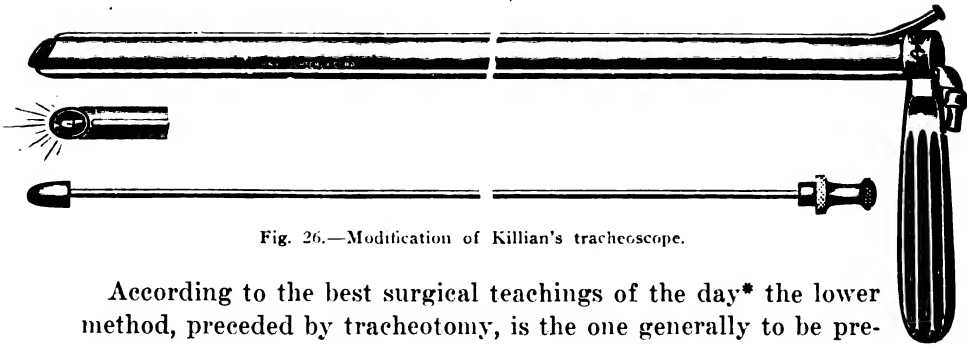


Fig. 26.—Modification of Killian's tracheoscope.

According to the best surgical teachings of the day* the lower method, preceded by tracheotomy, is the one generally to be preferred in all cases of emergency, such as those in which there are extreme dyspnea and a tendency to collapse, or in which it is probable that the search for the foreign body will consume a great deal of time. It is obvious that in all these manipulations, care, gentleness, and infinite patience are required. Practice on the Killian phantom is essential to success, and should certainly be done before this method is practiced upon the living patient.

Summary

When foreign bodies lodge within the larynx, trachea, or bronchial tubes, and seriously obstruct respiration, tracheotomy as an emergency procedure offers the only possible means of prompt

*Bryant and Buck, Vol. v, p. 912.

relief and should be the operation of choice. Where the patient recovers from the acute symptoms, and respiration is not seriously embarrassed, the patient should be allowed sufficient time to recover his strength. Killian's upper method of tracheoscopy offers the safest and best method of removal, which should not be delayed longer than thirty-six to forty-eight hours.

FOREIGN BODIES IN THE EARS

Bugs, roaches, and insects of various size not infrequently find their way into the ear, and children sometimes find pleasure in



Fig. 27.

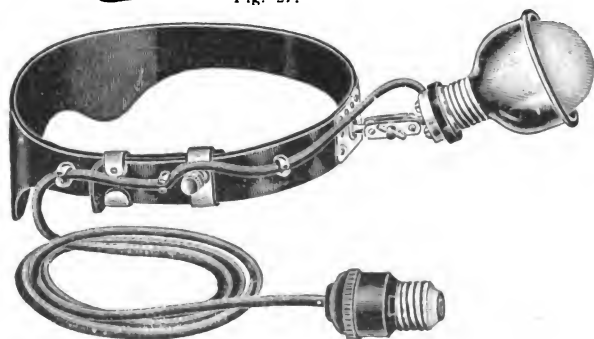


Fig. 28.

Figs. 27 and 28.—Types of electric head lamps.

placing therein kernels of corn, beans, and peas. In removing foreign bodies from the ear, the attendant is often obliged to use his ingenuity. It is not often a simple matter. A good light or artificial illumination is indispensable and in order to properly examine the ear, an aural speculum is indispensable. (Figs. 27 and 28.)

If the foreign substance is a live bug, its movements may be exceedingly painful, and, owing to fright or nervousness, the patient is particularly liable to syncope or may become frantic and unmanageable. A few drops of any bland oil will usually suffice to asphyxiate the bug and stop its movements, after which it may usually be removed by flushing the ear with tepid water. For this purpose a fountain syringe holding a quart or more of warm water with a small glass medicine dropper or pipette for a nozzle, is a most excellent device. The glass tip should be held at the upper margin of the auditory canal (not thrust in) and only sufficient force used to gently flush out the canal, the force being



Fig. 29.—Hartmann's ear forceps.

controlled by elevating or lowering the water bag. If too great force is used, it may produce dizziness or headache, with nausea and vomiting. Should this means fail, the offending substance may be removed with the aid of a good light and speculum, and a small ear forceps or spud (Fig. 29).

The author very vividly recalls a case occurring in his early practice where a honeybee entered the ear of an elderly gentleman and complicated matters by inflicting his sting on entering the auditory canal. When brought to the office the old gentleman had vomited repeatedly and was in a condition of collapse. A few drops of chloroform dropped into the ear, followed by olive oil, very soon stopped the antics of the bee, but after several

futile attempts to remove the intruder, an anesthetic had to be employed before it was possible to introduce an ear speculum and remove the bee.

When the foreign substance consists of some hard substance, such as a dry pea or kernel of corn, and especially where unsuccessful efforts on the part of members of the family have been made at extraction, the offending substance having been pushed well back into the auditory canal, it will save time and trouble to administer a general anesthetic, and even then extreme care must be taken not to force the foreign body through the ear drum into the middle ear. If after repeated efforts it is not found possible to extract the foreign body through the auditory canal, a posterior incision may become necessary. Under careful asepsis the ear is drawn forward and an incision made along the line of its auricular attachment down to the bone; the periosteum is then elevated and the bony canal exposed by blunt dissection, the cartilage of the canal is split longitudinally and held apart, including the auricle, with a small retractor, or gauze sponge, thus exposing the meatus. If more space is required, the meatus may be enlarged by the chisel along its posterior aspect until the space is sufficient to remove the foreign body, after which the fibrocartilage is dropped into place and, with the auricle carefully sutured in its normal place, the wound is then dressed with sterile gauze, and a good recovery is ordinarily to be expected.

FOREIGN BODIES IN URETHRA AND BLADDER

Foreign bodies are sometimes, either by accident or intention, forced into the bladder. In the female, hairpins have been pushed into the bladder in attempts at performing abortion, and in the male, broken catheters are a frequent accident, and tax the ingenuity of the emergency surgeon to safely remove them. Pieces of bone, small marbles, glass tubing, buttons, and many other objects have been pushed into the bladder where they finally cause irritation, infection, and cystitis.

Treatment

With the aid of the cystoscope (Fig. 30) and variously constructed alligator forceps and lithotrites, many foreign bodies can

now be safely removed from the bladder of male patients without resorting to cystotomy, formerly so much in practice. In females it is often possible to dilate the urethra sufficiently to introduce an endoscope, through which the foreign bodies can readily be located and removed. In the male, crushing of the foreign substance is often impossible, or the object so large that it can not be withdrawn without serious injury. An incision, therefore, in

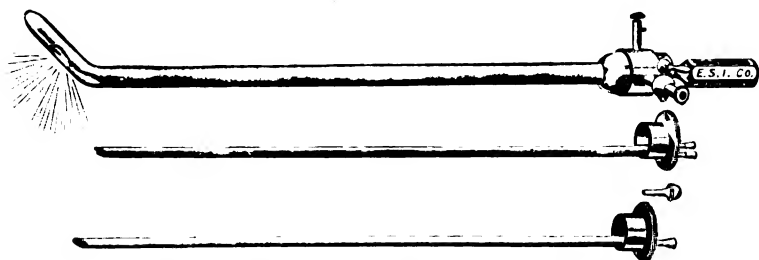


Fig. 30.—Braasch direct catheterization cystoscope.

this class of cases, must be made either through the perineum or suprapubic area, and the object extracted. The technic being the same as that of lithotomy or removal of a stone from the bladder, the reader is, therefore, referred to works on general surgery for further details.

FOREIGN BODIES IN THE EYE

A foreign substance lodging under the upper eyelid causes immediate and marked distress, accompanied with a copious flow of tears. There is usually more or less photophobia, with inability to raise the upper eyelid, and a scratchy feeling on moving the eyeball or lids. When the foreign body lodges in or on the cornea, it may not cause much distress for several hours, and frequently not until the second day, or until the patient comes in contact with the glare of artificial light. The suddenness of the attack, and a well-defined description of some substance having entered the eye, makes the diagnosis positive.

If the eye is very sensitive and pain is severe, a few drops of a 2 per cent solution of cocaine should be dropped into the eye and the puncta lacrimalia held closed by the finger for a few minutes. The eyelid should then be everted and an ordinary diagnostic blunt

probe should be passed along under the fold or sulcus from the outer to the inner canthus. If the foreign substance is lodged upon the cornea, it should be carefully inspected, turning the eyeball in various directions. A two-inch focus lens is often of great aid in directing a stream of light over the cornea by which the object can be easily located. When the offending body has lodged under the upper lid, it is usually found adherent to the lower half of the upper lid, but many times it is located above the fold and while the lid is still everted, the patient should be directed to look downward. The lid may then be elevated from the eyeball, and a small swab of cotton on a spud or toothpick, moistened in a solution of boric acid, should be used to gently wipe the under surface of the lid.

Sawdust in the eye is often extremely difficult to locate. It usually lodges very near the lid margin, and is best removed by following the margin of the lid with a small, moist pledget of cotton on a probe.

If the foreign body is found lying on the surface of the cornea, and not deeply buried, it can be readily removed with an eye spud or a broad, flat, surgical needle. Great care should always be employed not to scrape the cornea and denude it of its epithelium, as is so frequently done. If the foreign body is deeply buried in the cornea, it may be removed by means of a cataract knife, or the point of a flat surgical needle, care being taken not to penetrate the cornea. Dr. John W. Wheeler, of New York, has invented a "corneal curette" which greatly facilitates the removal of these substances. He describes his method of using the curette as follows:

"Before attempting to remove the foreign body the cornea should be rendered entirely anesthetic. This may be done by instilling two or three times, at intervals of three or four minutes, a 4 per cent solution of cocaine hydrochlorate, or 1 per cent holocaine. The patient is then seated in a chair of such height that his eye will be easily accessible to the surgeon, who stands behind him. An eye speculum is called for only in the case of exceptional patients who will not open the lids when told to do so. Either artificial or natural light is thrown on the cornea with a condensing lens, and the patient is instructed to look with his unaffected eye at a point which will cause him to hold the injured eye

in a position that will enable the surgeon to see the foreign body most distinctly. In holding his lids open, the patient is assisted by the surgeon's fingers. The lens is held in one hand and the instrument is held lightly in the other, very much as a pen is held in the hand. The accompanying illustration (Fig. 31) shows the position which the surgeon and the patient should assume.

The edge of the instrument should be sharp, and should cut with gentle pressure; the operator works the instrument behind the foreign body and lifts it from its bed in the cornea. Usually



Fig. 31.

the foreign body is dislodged by a single motion and floats away in the lacrimal secretion, or stays in the hollow of the curette.

When the point is used, the shank is made to act as a guard, so that there need be no fear of penetrating into the aqueous chamber.

As a rule, if the foreign bodies are removed entirely, the little wounds of the cornea heal up quickly. It is a wise precaution to prescribe argyrol 5 per cent, or some other mild antiseptic, to be used by the patient three or four times a day for a period of a

few days, as occasionally infection in these wounds occurs and leads to ulceration of the cornea. A bandage should also be prescribed to keep the eye at rest. If only the superficial epithelial layer of the cornea has been injured, the patient can be promised no impairment in his vision, but when the deeper layers are injured, scar formation always results, and cicatricial tissue in the



Fig. 32.—Wheeler's corneal curette.

pupillary area means direct interference with the function of vision. Even if these scars are peripheral to the pupillary area of the cornea, irregular astigmatism in greater or less degree results. This astigmatism can not be corrected by any lens; hence the



Fig. 33.—A popular method of dressing the eye after removal of foreign bodies.

seriousness of foreign body wounds to the cornea from the point of vision.

If a foreign body has penetrated to the interior of the eyeball, the patient should be sent at once to a specialist trained in extracting bodies from the globe. A radiographer skilled in the work can estimate to the fraction of a millimeter the position of minute

or large foreign bodies which have penetrated the eyeball. There is considerable difference of opinion as to the best method of removing these bodies, but the majority of the oculists agree that a nonmagnetic foreign body hanging in the vitreous should not be submitted to operative interference unless the eyeball has to be removed. But if in contact with the wall of the globe, it may be removed through an opening as near as possible to the site of the foreign body. Magnetic foreign bodies should be drawn into the anterior chamber of the eyeball through the ligament of the lens by application of the giant magnet, or through the lens itself if it has been injured. They should then be drawn out of the anterior chamber through the incision in the cornea by application of a small hand magnet.

Although the prognosis for eyes penetrated by foreign bodies is always grave, a large proportion of such eyes should be saved with good vision, provided that the lens is not injured, and even in cases in which there has been an injury to the lens, good vision should later follow the extraction of the lens.

FOREIGN BODIES IN THE RECTUM

Insertion of foreign bodies into the rectum is a common occurrence, and the tendency of the sphincter muscle to contract, or grasp the object inserted within the anus, probably explains why these objects may sometimes be forced or carried upward, and even above the sigmoid into the colon.

Treatment

If the foreign body has been recently inserted and is not of a fragile character, and is within reach of the finger, it can usually be very easily withdrawn by simply dilating the anus and rectum with or without a rectal speculum, with the aid of the finger, or grasped by a suitable forceps, for which purpose the small placental or alligator forceps (Fig. 34), serves an admirable purpose. The author has been called on at various times to remove a dessert spoon, a six-inch tin whistle, a round doorknob, a large brass key, a closed penknife, and a round or wooden end of a hammer handle. If, however, the object has been retained for some time

and becomes more or less impacted, producing symptoms of irritation, edema, or tumefaction, its removal may become a very intricate and difficult affair. It sometimes becomes necessary to divide the sphincter, anal verge, or perform a celiotomy.

The removal of fragile bodies, such as glass bottles, etc., from the rectum sigmoid, or colon, is often attended with serious difficulty, and very great care is required to prevent crushing or breaking of the glass, in which event the sharp fragments may cut or penetrate the intestinal walls, and cause a fatal infection or peritonitis.

Dr. Bernard Asman* reports a number of cases in which glass bottles or other glass articles had been inserted into the rectum, requiring surgical intervention for their removal. His instruc-

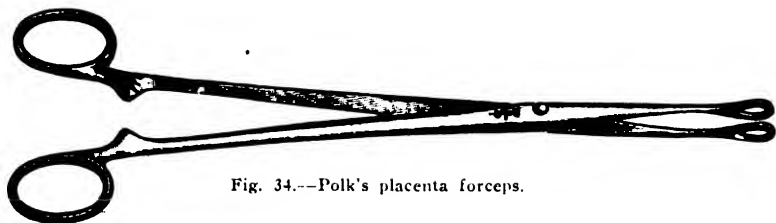


Fig. 34.--Polk's placenta forceps.

tions are as follows: "The patient being under anesthesia where it is found impossible to remove the foreign body after the sphincter muscle has been dilated as widely as possible, many surgical authorities advise that an incision be made as recommended by Kocher for excision or extirpation of the rectum. This incision is made in the median line, splitting the rectum and tissues from the anus backwards to the tip of the coccyx, or the coccyx may be removed if it be necessary to afford sufficient space for the introduction of the hand in order to grasp and remove the foreign body." Asman advises, however, that if the sphincter muscle must be divided, it should be incised squarely across in the transverse anal line instead of the anteroposterior, as better union of the severed ends can be secured. The sphincter being divided, the incision is extended to the ischial tuberosity upon the left side, which gives sufficient space to introduce the entire hand. Dr. Asman has also devised an anal dressing tube made in different sizes which may be used to advantage in his method of dressing

*Asman: Am. Jour. Surg., xxvii, No. 9.

the anorectal operative wound in the effort to obtain primary union without infection. He thus abolishes the older method of gauze packs and healing by granulations.

Celiotomy

When the foreign bodies, whether of glass or other hard substances, have passed above the sigmoid flexure, and are sufficient in size to cause obstruction, or have become impacted in the colon above the rectosigmoidal junction, celiotomy is considered the safest and best method of removal and is advocated by surgical writers.

The operation is performed as follows: In emergency cases no prolonged or complicated method of sterilizing the abdominal wall is employed. Dry shaving and the application of tincture of iodine is all that is necessary. A favorite incision is through the left rectus muscle. The incision should be long enough to permit of thorough exploration, and rapid, safe work. The fibers of the rectus should be separated, or the entire muscle pushed aside and the tissues beneath carefully divided.

The peritoneum is seized, opened, and held by long Peon forceps, or the edges of the abdominal skin incision may be seized and held with tenaculum forceps, which include within their grasp the sterile gauze or protective padding now so much employed as an additional measure in the prevention of sepsis. Through this wound the lower abdomen, sigmoid and pelvis can be readily explored and the trouble located. It is rarely necessary to open the colon or perform a colostomy. The foreign body may be gently pushed downward and held so it can be reached and removed through the rectum. After which the abdomen is closed and dressed in the usual method and, in clean cases, without drainage.

FOREIGN BODIES IN THE STOMACH

Foreign bodies are frequently accidentally swallowed by children and others. Lunatics, idiots, and certain "freaks" seem to find pleasure in swallowing anything or everything they can possibly force down their throats, hence there are many cases of

record where a conglomerated mass of nails, keys, safety-pins, knives, spoons, forks, iron bolts, button hooks, pieces of lead, buttons, etc., have been removed from the stomachs of these individuals.

The articles commonly swallowed by children are pennies, nickels, pins, marbles, buttons, or small toys. Ordinarily there may be little or no disturbances, and in from three days to a

Fig. 35.—Autopsy held by Dr. George Boody on an insane patient. Stomach contained 181 foreign bodies. Note case knife made into a dagger, wire, file, overshoe buckies, etc.

week the foreign body will be evacuated with the bowel movement. Occasionally there may be local symptoms, loss of appetite, vomiting, and if there is any injury to the mucous membrane of the stomach or bowel, there may be hemorrhage with the usual symptoms of anemia or exhaustion. In cases of this character an x-ray examination should be made in order to locate the foreign body and determine the nature or character of the treatment.

Treatment

It is not good treatment to immediately administer a purgative. The usual custom is to give plenty of milk, potatoes, rice, bread, etc., in order to form a large protective mass about the foreign body, and after the second or third day it is customary to give a laxative of castor oil. Should the foreign body not pass in three or four days, a rectal examination should be made, for not infrequently the foreign body will be found near the sigmoid, within reach of the finger. Indications of perforation, peritonitis, or intestinal obstruction, call for an immediate x-ray examination, and possibly an early laparotomy.

CHAPTER III

TREATMENT OF ASPHYXIATION FROM DROWNING, SMOKE, GAS, ELECTRIC SHOCK. DESCRIPTION OF MECHANICAL DEVICES FOR ARTIFICIAL RESPIRATION

DROWNING

History

Drowning as a form of capital punishment was common throughout all Europe in the early centuries. Tacitus, 450 B. C., writes that the Germans hanged their greatest criminals, but less offenders were plunged into bogs under hurdles and drowned. By the law of the ancient Burgundians, faithless wives were punished by drowning in mud. The Anglo-Saxon code provided that women convicted of theft should be drowned. Drowning, as a form of capital punishment, was practically abolished by all Christian nations about the middle of the fifteenth century; however, in Scotland, the right of choice between hanging or the pit was sometimes granted a criminal, as noted in the case of an aged man, in 1556, where, by special grace of Queen Mary, the criminal selected death by drowning.

General Remarks

The popular fallacy that a drowning person always sinks and rises three times is not by any means true, and can not be too strongly denounced, and to await the second or third "arise" before rendering assistance is cowardly and brutal.

It is usually supposed that when a good swimmer drowns apparently without a struggle or outcry, he is seized with violent cramps which completely unnerve him. This may or may not be true, but such results often follow a prolonged or exhaustive swim too soon after partaking of a hearty meal, death being due to cerebral congestion or hemorrhage, acute indigestion or fatal

syncope. Likewise, the custom with some boys of racing to the swimming hole, thus becoming excited and overheated, with greatly increased blood pressure, and plunging suddenly into the water much cooler than their bodily temperature, often leads to disaster.

Encyclopedia and magazine articles relative to the length of time a person may be resuscitated after submersion in water are so misleading and confusing as to often cause uncalled for and unjust criticism by the laity of physicians engaged in rescue work. Illustrative of this, I quote the following from the *Independent* (vol. lviii, p. 1491): "Persons have been resuscitated from apparent death from drowning as long as two hours and a half, after their disappearance from the surface of the water, and the mere fact that a person does not breathe and has no pulse or even no signs of heartbeat is not a definite sign of death." The *New American* states that "instances have been recorded in which patients have been submerged twenty and thirty minutes and have recovered."

The facts are, very few live after being submerged to exceed two or three minutes, and those who in consequence of fainting or becoming paralyzed through fright, and sink without filling their lungs with water, are much more likely to be resuscitated.

Symptoms

Death by drowning in the majority of cases is due to apnea or suffocation from deficiency of oxygen, as a result of submersion in water or fluid. The usual type or clinical picture from a medical standpoint may be described as follows: There is always first, a spasmodic closure of the glottis from direct irritation of the water or fluid, as it enters the pharynx, or posterior nares. Fear or fright is always more or less an important factor, and the individual now commences to struggle desperately to recover his respiration, and maintain his position on the surface of the water. Through his frantic endeavors he becomes rapidly exhausted, and in his efforts at inspiration draws a small amount of fluid into the larynx and lungs, which produces involuntary expulsive seizures beyond his control, and in his desperation he draws more and more fluid into his lungs until pulmonary congestion or oc-

clusion is more and more pronounced. During the convulsive efforts the lips and face become cyanotic, the tongue protrudes slightly from the mouth, the eyes bulge and the features become distorted. Through great strength or endurance, the individual may struggle for several minutes on the surface of the water, but when fluid enters the larynx and lungs, two or three minutes is usually sufficient to render the individual unconscious, and he sinks beneath the surface. Submersion for from one to three minutes usually suffices to stop all heart action. In another class or series of cases where the patient falls into the water, or is submerged suddenly, he is found dead when almost immediately rescued. Many of these cases sink to the bottom at once, death being attributed to nervous shock, fright, syncope, or possibly are the result of organic, lung, or heart disease.

Treatment

When a person supposedly drowned is taken from the water, the first thing to do is to clear the mouth and throat, and especially the epiglottis. This may be accomplished by means of a handkerchief, small pieces of clothing, or the fingers alone. This will not only clear or remove any obstructive substance, but tend to cause vomiting and voluntary expulsion of the offending substance. If this does not suffice, inversion of the body, shaking the patient, slapping or pounding the chest and back has proved successful in many instances.

The next step is to remove the water from the lungs. This is done by pulling the tongue forward and elevating the body as in Fig. 36.

This accomplished, all efforts must now be directed towards restoration of breathing. There are two methods commonly recognized as the most efficient for producing artificial respiration.

The Sylvester method consists in placing the patient on the back on a flat surface, inclined slightly upward from the feet, the head and shoulders being raised and supported on a folded article of clothing placed under the shoulder blades.

The tongue is drawn forward and fastened by a Morse tongue forceps or by an elastic band, string or tape over the tongue and under the chin to keep it projecting beyond the lips.



Fig. 36.—Illustrating the author's method of removing water from the stomach and lungs, by placing the body face down over the knee and elevating the trunk and limbs, the mouth and tongue forceps having been applied. The left hand of the physician on the forehead of patient elevates the head and slightly extends the neck, the right hand pressing firmly on the base of the lungs forces all fluid from lungs and stomach.



Fig. 37.—Illustrating the Sylvester method of artificial respiration; first position, inflating the lungs.

Then, to imitate the movement of breathing and to draw air into the lungs, the operator stands at the patient's head, grasping the arms just above the elbows, and draws the arms upward above the head, keeping them stretched upward for two or three seconds. (Fig. 37.)

To expel the air from the lungs, the arms are brought down and pressed firmly for two or three seconds against the sides of the chest. (Fig. 38.)

These movements are repeated deliberately and consistently about fifteen times a minute until a natural effort to breathe is perceived.

Efforts also should be turned towards inducing circulation and warmth, which can best be promoted by briskly slapping and rubbing the limbs upward, thus propelling the blood along the veins to the heart, and by the application of hot blankets, hot water bottles, etc., to the pit of the stomach, thighs, and armpits, and the soles of the feet.

The second, known as the Schäfer, or "prone pressure," method, as modified by Dr. Benjamin Howard, of New York, has the advantage of simplicity, and can be applied by one person.

The body is placed face downward, with a roll of clothing under the stomach, one arm being bent upward to support the forehead. (Fig. 39.)

In order to expel the water from the chest, the body is pulled feet downward over the roll of clothing.

The operator then kneels over the body, one knee pressing firmly against either thigh, with both hands spread over the lower part of the back so that the thumbs hook in under the lowest ribs on each side. (Fig. 40.) The operator presses forward with the weight of the body on the arms, thus raising the ribs and enlarging the chest cavity and causing the air to enter. When the ribs have been pushed upward to their utmost expanse, they are then released gently by a receding movement, allowing them to return to their original position, thus expelling the air. (Fig. 41.)

This process is repeated slowly and regularly until respiration is restored, or efforts of resuscitation seem to be futile.

The advantages of the Schäfer method are: (a) easy performance, little muscular exertion; (b) larger ventilation of the lungs than



Fig. 38.—Sylvester method, second position, forcing the air from the lungs.



Fig. 39.—Illustrating the Sylvester method of expelling fluid from the stomach and lungs.



Fig. 40.—The Schäfer, or prone, method. Inflating the lungs.



Fig. 41.—Schäfer's method of expelling the air from the lungs. Note tongue protruding held by a Morse forceps.

by the supine method; (c) simplicity; the operator makes no complex motions and readily learns the method on first trial; (d) no trouble from the tongue falling back into the throat; (e) no risk of injury to the liver or ribs if the method is executed with proper care.

MECHANICAL DEVICES FOR ARTIFICIAL RESPIRATION

There are many mechanical devices or appliances for the performance of artificial respiration in use today. Among these may be mentioned the pulmotor, the lungmotor, the Bart, the Salvatore, and the Meltzer apparatus, or pharyngeal insufflation or mask method. The pulmotor and the lungmotor have been used very

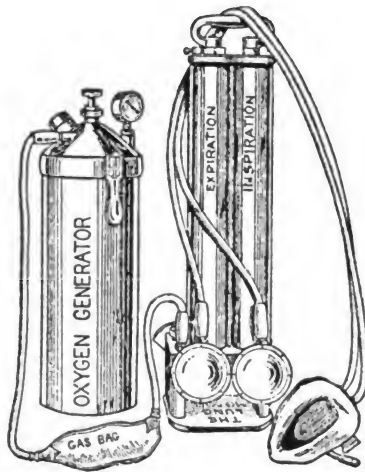


Fig. 42.—Method of attaching oxygen generator to lungmotor.

extensively and advertised widely as life-saving devices and a brief description of each apparatus and its working principles is necessary for the intelligent use of either appliance. The pulmotor and the lungmotor are for two purposes: First, for artificial respiration; second, for the administration of oxygen.

The Pulmotor

The pulmotor is an apparatus fitted into a narrow wooden box much the size and shape of a large suit-case and having a leather

handle making the device convenient for one person to carry, its weight being about fifty pounds.

The device consists of a cylinder containing oxygen under pressure which when released by a valve keeps the pulmotor in operation but only so long as this oxygen lasts which is a period of about forty minutes. The oxygen passes from a cylinder through the reducing valve to the injector. Here a large volume of air is drawn in by suction and propelled by force through a flexible tube in front. The suction and delivery constitutes a motor which automatically fills the lungs by pressure and empties them by suction.

While the lungs are being inflated the pressure in the flexible tube is equal to the pressure in the lungs but as soon as the lungs are filled the tube becomes distended, moves forward over a valve in the reversing chamber and suction begins. As soon as the lungs are emptied the flexible tube contracts and reverses the valve for pressure and inflation of the lungs again.

The rhythm of the motor is determined by two factors: First, the snugness with which the mask fits the face; second, by the capacity of the lungs, the smaller the lung capacity the faster the rhythm, while a leaky or ill-fitting mask will prevent or destroy the rhythm entirely. This rhythm simulates the normal respiratory movements without effort on the part of the operator. However, in order to insure perfect action of the mechanism, there are three points to bear in mind; namely: First, see that the rubber mask fits the face perfectly; second, keep the tongue forward by means of the tongue forceps; third, keep the trachea open and the esophagus closed by gentle digital pressure over the cricoid cartilage.

After respiratory movements have been established, turn the valve from pulmotor to inhalation and give the patient as much oxygen as necessary to overcome the asphyxia.

As to the efficiency of the pulmotor the author quotes the criticisms from the report of Commission on Resuscitation of the National Electric Association of New York City as follows:

"The automatic mechanism of the pulmotor, while being an ingenious technical contrivance, instead of assuring artificial respiration, may interfere greatly with its efficiency because it is liable to cut off inspiration prematurely. The management of the

changes in the phases of respiration when the pulmotor is worked by hand is more reliable, but when handled in this manner no practical difference exists between the pulmotor and the Bart apparatus, at least so far as the mechanism is concerned. In both machines, however, the expiration is accomplished by suction, which is a serious defect. The sucking action of these devices may prove even dangerous if they are used continuously to keep up respiration for a long time, and the forcing of air into and from the stomach may cause movements of the thorax which simulate respiration while actually no air enters or leaves the bronchial tubes. Both machines, the pulmotor and the Bart are heavy, expensive and waste a great deal of oxygen with which they are not sufficiently provided. The absence of careful analysis of the action of the pulmotor in clinical cases, the ease with which it may fail to cause inflation of the lungs, the bad effects which occur if its sucking action is permitted to continue for a long time, are all important considerations which should be taken into account in judging the value of the instrument."

In conclusion, the members of the committee agreed upon the following suggestions:

"In cases without respiration, that is, when respiration has ceased, the pulmotor should be used only by hand and then not faster than twelve or thirteen complete respirations per minute. When left to run automatically, it is liable to be inefficient and dangerously deceptive."

The Lungmotor

The lungmotor, like the pulmotor, is a very compact apparatus and is fitted into an oblong carrying case. It is much lighter, more convenient and more readily transported than the pulmotor.

This apparatus consists of two cylinders, one for pressure, and one for suction, each having a separate piston. These cylinders are united at the base in a foot plate and at the top in a handle, giving the appearance of a double cylinder bicycle pump or automobile tire pump. This pump, working by hand, gives the operator absolute control over the inflation force, the rate, and the volume, as well as the suction power. At the bottom of each cylinder is a nozzle for the attachment of the rubber tube leading

from the cylinders to the face mask, while behind the pressure cylinder at its base is the mixing valve giving and indicating the degree of mixture of air and oxygen. At the top of the cylinders near the handle is the volume regulator composed of three circles with an indicating pin swinging on a graduated dial. The inner circle gives the size of the patient as infant, five years old, ten

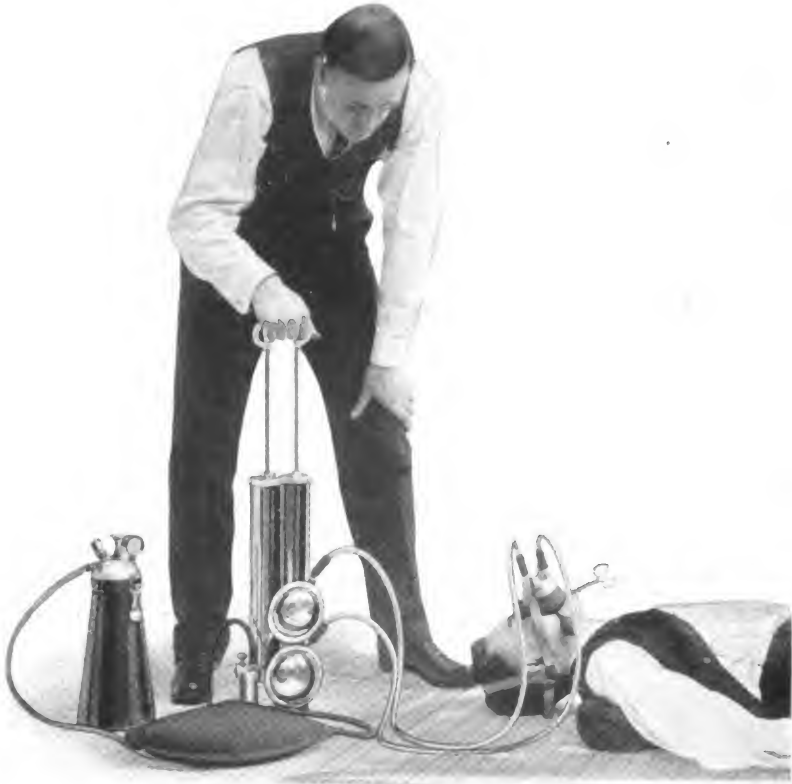


Fig. 43.—Lungmotor and oxygen generator in use.

years old, fifteen years old, average adult, large adult. The middle circle gives the number of strokes necessary per minute according to the size of the patient. The outer circle shows the air volume given or taken from the lungs at each full stroke of the piston.

The upward stroke of the handle of the lungmotor fills one cylinder (right one in illustration) with air or oxygen or a mixture of the two gases according to the mixing valve. At the same time the other cylinder fills with expired air drawn from the lungs of the patient. The downward stroke of the piston forces the air or the air-oxygen into the lungs of the patient and discharges the expired air into the open.

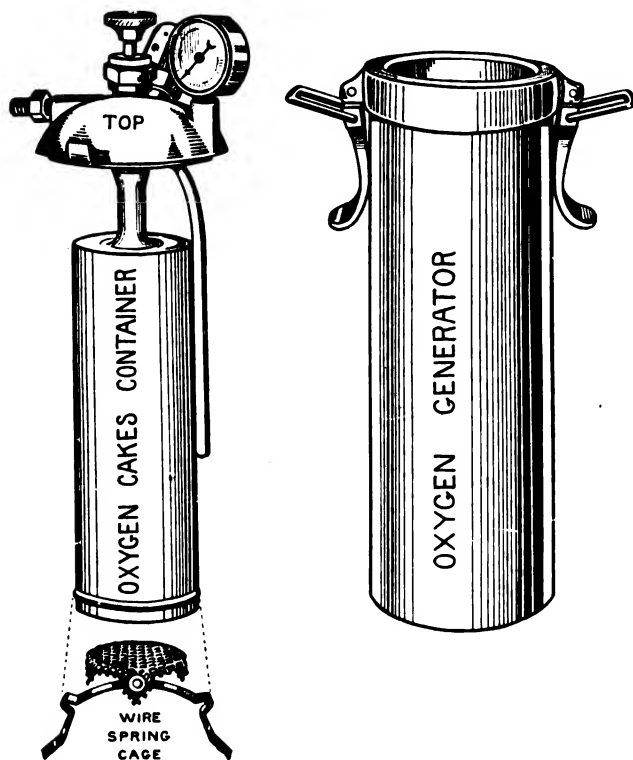


Fig. 44.—Oxygen generator of lungmotor.

The oxygen supply for the lungmotor is derived from the oxygen generator which consists of a large cylinder with an inner tube or cylinder called the oxygen cake container. This container is made of screen wire to permit the water from the larger cylinder to permeate and attack the oxygen cakes composed of

fused sodium peroxide. These cakes when attacked by the water give three hundred and twenty times their volume of oxygen. This cylinder and the oxygen cakes are put in place after the lungmotor with "All Air" is started on the patient so as not to waste valuable moments in securing respiration. At the top of the oxygen generator is a gauge to indicate the total volume of oxygen in the generator and a valve to control the amount allowed the lungmotor for injection into the lungs.

The lungmotor is also supplied with an ingenious method of preventing the air forced from the cylinders entering the stomach. This apparatus consists of a short rubber tube having a bulb at one end and a thin collapsed rubber wall at the other. This collapsed wall is inserted into the esophagus, and by pressure on the bulb at the other end, the esophagus is tightly closed prevent-

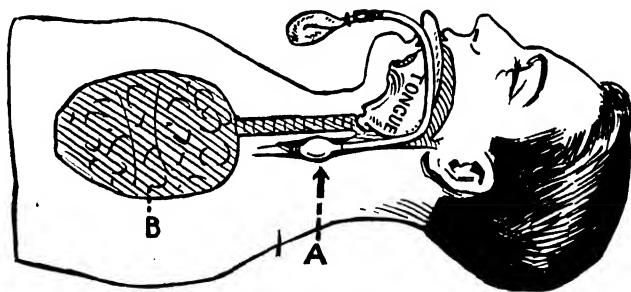


Fig. 45.—Showing throat tube in place in throat (A), and now inflated 'to fit the throat.

ing any air from passing the larynx, except by way of the trachea.

The lungmotor is a recent invention among the life-saving devices and should be not only a part of the equipment of every modern hospital, bathing beach, electric station, and gas plant, but should be studied by all persons connected therewith. For this reason the author gives a brief routine treatment for resuscitation from drowning by use of either the pulmotor or lungmotor.

Treatment of Drowning by Pulmotor or Lungmotor

In the management of drowning cases more perhaps than any other emergency is there the absolute necessity for the physician to be master of the situation. He must act quickly, keep cool,

and quietly but firmly restrain excited and curious bystanders and relatives. While each case is a law unto itself, the following routine may serve a valuable purpose in many cases where the physician has either the lungmotor or the pulmotor to aid him.

1. After removal from the water cut off any constricting clothing from the neck or chest as tight collar, corset, etc.

2. Force the water from the lungs and stomach by grasping both your hands beneath the belly of the patient and gently elevate and lower the body or use the method as shown in Fig. 36. This must be accomplished in a few seconds at the most.

3. Clear the throat of any vomitus, mucus, or food by a quick

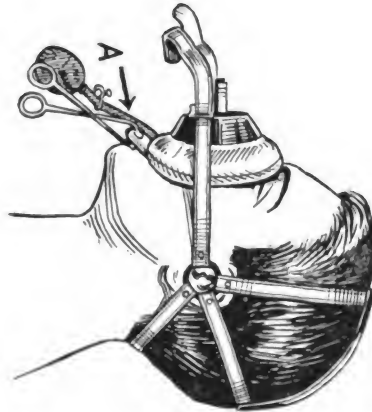


Fig. 46.—The tongue forceps are shown on the tongue, which is well drawn forward. It also shows the throat tube (a) projecting from under the face mask.

sweep of the fauces with a swab or a handkerchief wrapped on the index finger, and remove false teeth if any be present.

4. Use one of the methods described under artificial respiration until the lungmotor or the pulmotor arrives and is ready for use.

5. Place the head of the patient over a roll of clothing or a log, thus throwing the head backward and making a straight open canal for the entire respiratory tract.

6. When the lungmotor or pulmotor is ready, grasp the tongue with a tongue forceps and pull it forward, apply the face mask and if it does not fit perfectly, wet a handkerchief and place it around the edge of the mask, then start the apparatus.

7. Gentle digital pressure over the cricoid cartilage will facilitate the passage of air into the larynx.

8. See that the thorax rises and falls with each stroke of the apparatus, and if not, you know that the air is not entering the lungs. It may be going into the stomach or escaping around the face mask. In the lungmotor the esophageal tube will prevent the passage into the stomach, while the wet handkerchief prevents leakage about the mask.

9. Massage the heart by gently pressing downward, or tapping the skin on the left chest just below the ribs. Hot applications also applied over the cardiac region are very efficacious.

10. Cover the patient with blankets and surround him with hot water bottles if possible.

11. Give a hypodermic of atropine sulphate, or 15 minims of adrenalin chloride 1:1000 solution, or camphorated oil.

12. When the patient regains consciousness, give a cup of black coffee.

13. Do not cease all efforts of resuscitation for at least forty minutes, and if then no signs of cardiac activity return, the task is hopeless.

14. After the patient can be moved, put him to bed between blankets and give stimulants to overcome shock and to sustain circulation and respiration.

The Meltzer Apparatus

This work on the mechanical devices for artificial respiration would not be complete without a brief description of a very simple, inexpensive, but very efficient, little device called the Meltzer apparatus. This device, known also as the pharyngeal insufflation method, is based upon the following considerations: When air is insufflated into the pharynx, it may not enter the lungs, but may escape through one of several channels, as the nose, the mouth and the stomach. To prevent this escape of air through these exits, Dr. Meltzer has the device equipped as follows: The escape through the nose is prevented by placing an elastic tube into the pharynx which raises the soft palate, closing the posterior nares. The escape through the mouth is restricted by applying pressure under the chin, while the opening into the esophagus is blocked by one of two methods: First, a tube inserted into the stomach to remove the air; or, second, by placing a heavy

weight upon the abdomen which prevents the distention of the stomach and the passage of air into it.

The Meltzer apparatus, while known as the pharyngeal insufflation method, can be used also by the mask method as the two devices previously described.

By the pharyngeal method a metal pharyngeal tube is made to fit the throat and is connected by means of a short piece of strong rubber tubing with the proximal end of the respiratory valve. This valve is attached to the metal cylinder and is controlled by a ring outside the cylinder. When this ring is moved to the right or left, it opens and closes the respiratory valve, giving inspiration and expiration. This valve has at its distal end a foot bellows giving the operator complete control over the rate and force of air intake and giving a continuous air current. A heavy weight and a wide, strong belt to compress the abdomen complete the outfit.

The apparatus which Meltzer has devised has the following commendable features: (1) Its positive action is determined by the operator and not left to the automatic mechanism which may fail to operate. (2) It is free from a sucking action during expiration. Expiration results from the normal recoil of distended parts. (3) It is light. (4) It is not an expensive device. (5) It is simple to operate, being an apparatus which can be employed by laymen and being very efficient and free from danger.

The Life Motor

The life motor, the latest mechanical device for resuscitation is constructed on the same physiologic principles as the lungmotor. The maximum is under constant control of the operator since the operating force is a hand pump. The important feature of this instrument is a mask, which allows of spontaneous respiration without its removal. This is a particularly important point of improvement, for the operator can ascertain whether or not the patient has begun to breathe naturally without removing the mask. The life motor comes in a small, convenient, compact case making it readily portable. The pump is operated by a takedown handle controlling the suction and pressure cylinders.

The accompanying illustration shows the carrying case and the mechanism and general principles of the life motor. (Fig. 47.)

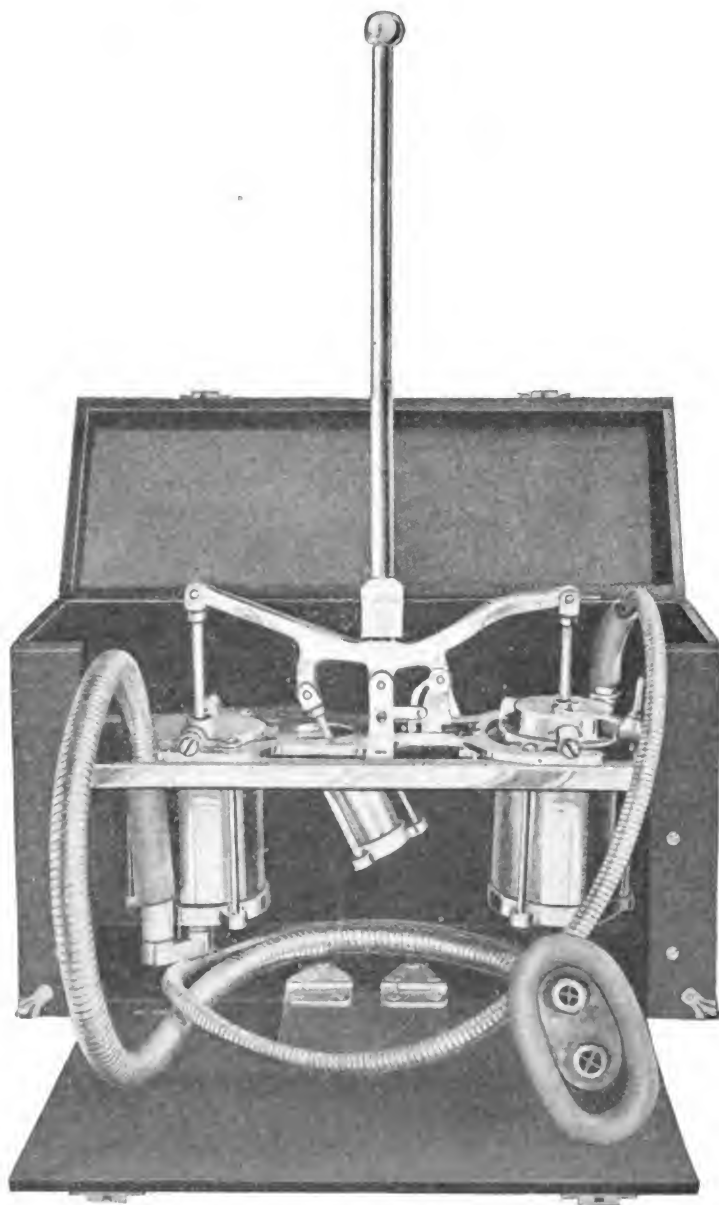


Fig. 47.—The life motor.

Rescue Breathing Apparatus

The improved Draeger type of breathing apparatus (Fig. 48) now in use by the United States Bureau of Mines may be used in the rescue work of mines, as well as from the smoke of burning



Fig. 48.—Draeger type of breathing apparatus.

buildings, poison wells, sewers, etc. All physicians engaged in emergency work of mines or in the employ of fire departments in the larger cities should become familiar with the apparatus.

The Draeger breathing apparatus consists of a knapsack with two cylinders of oxygen which contain a pressure of 150 atmospheres, or oxygen enough for two hours' service. Resting upon the breast of the wearer are the two breathing bags, one connected with the oxygen supply, the other to the exhalation tube or regenerator. A reducing valve regulates the supply of oxygen from the cylinder, and an injector causes the air within the apparatus to pass through the supply and return tubes at the rate of 50 liters per minute, so that the exhaled breath is quickly carried through the regenerator, where the carbon dioxide is absorbed, and then to the cooler and supply tube.

A mouthpiece and nose clip, goggles and skull cap alone, or a face mask that covers the mouth and nose, may be used instead if so desired. The whole apparatus is supported upon a broad belt which is fastened around the body. A leather strap attached to the belt and passed through a pair of leather loops upon the body side of the breathing bag holds the bag in position when the wearer stoops or crawls. The breathing bag and cylinders may be hung from a pair of shoulder braces that can be adjusted by straps and buckled at the back to suit the height of the wearer.

For the protection of the wearer in fighting fire, a heat helmet is supplied when desired. The helmet is made of rawhide and has a mica window in front, but has nothing to do with the breathing.

The goggles are used with the mouth-breathing patterns of apparatus only when a man has to work in smoke or in gases that affect the eyes. The nose clip is used in the mouth-breathing patterns, and is held in place with adhesive plasters which make it fit the nose firmly.

Every man who has to use the apparatus should have his own mask or mouthpiece and nose clip, not only for sanitary reasons, but also that he may shape and adjust the mask until it is a comfortable and air-tight fit. The masks have soft copper bands set in the rubber and can be shaped to an air-tight fit for any face.

Before a man undergoes training in the use of the breathing apparatus, he should furnish a certificate of physical condition, especially the action of the heart and lungs, and any defects of the nose and throat should be noted. Unless a man has a physician's certificate as to his good physical condition, he should not



Fig. 49.—Mine rescue.

be permitted to take rescue training or attempt rescue work in mines. If possible, no rescue work should be undertaken just after eating nor less than two hours since the last meal. After having used the apparatus continuously for two hours, a man should be allowed to rest six or eight hours before wearing it again.

POISONING FROM CARBON MONOXIDE GAS, ILLUMINATING GAS, ETC.*

The presence of that poisonous gas, carbon monoxide (white damp), in the afterdamp of explosions and fires in mines has caused the death of a great many miners. An inspection of the reports of those explosions and mine fires in which men have been killed shows that this gas is often the cause of the majority of the fatalities. Haldane makes the statement that carbon monoxide poisoning is responsible for nearly all the fatalities. After a recent disaster at a mine in Pennsylvania in which twenty-one men were killed, the bodies of seventeen men showed no such marks of violence as would be produced by the concussion of an explosion. Tests of blood from some of these bodies clearly showed the bright pink hue caused by carbon monoxide. Examination of the blood of victims of other explosions has shown that carbon monoxide was largely responsible for the fatalities. Not only have men present in mines at the time of disasters succumbed to this gas, but rescuers endeavoring to save their unfortunate comrades have perished also.

Of the gases produced in mines, carbon monoxide is the most feared and the most difficult to detect. A miner's lamp gives warning of almost every dangerous condition of the atmosphere in a mine except the presence of this gas.

Carbon monoxide may be present in deadly quantities in an atmosphere without the safety lamp detecting it, because a proportion much below that required to affect a cap lamp flame is extremely poisonous.

Carbon monoxide is the main combustible ingredient of water gas, of producer gas, and of blast-furnace gas, which contain

*Parts of this discussion are taken from a paper by George A. Burrell: The Use of Mice and Birds for Detecting Carbon Monoxide after Mine Fires and Explosions, Department of the Interior, Bureau of Mines, Technical Paper No. 11.

approximately 15 to 40 per cent of it, and is present, but in smaller proportion, in illuminating gas made by the destructive distillation of coal. It has not been identified as a constituent of the samples of natural gas examined by the Bureau of Mines, a fact that accounts for natural gas being less poisonous than water gas, producer gas, or ordinary illuminating gas.

Physiologic Effect of Carbon Monoxide

The oxygen absorbed from the air in the lungs is normally taken up by the blood in the form of a loose chemical combination with the hemoglobin of the corpuscles, and in this form it is carried to the tissues where it is used. Hemoglobin forms a far more stable compound with carbon monoxide, and when saturated with the latter it can not take up oxygen. Hence, when the corpuscles in the blood of a living animal are saturated with carbon monoxide they can not carry oxygen from the lungs to the tissues, and death must result. According to Haldane, carbon monoxide has no other effect than that resulting from its interference with the oxygen supply of the tissues, and apart from its property of combining with hemoglobin, it is physiologically indifferent, like nitrogen.

The affinity of carbon monoxide for hemoglobin is about 250 times as great as the affinity of the latter for oxygen. However, if oxygen is administered to a person not too far overcome, the carbon monoxide will be completely driven out of the blood. In this respect pure oxygen acts about five times as rapidly as normal air, which contains approximately 21 per cent of oxygen. From air containing very small percentages of carbon monoxide, less than 0.1 per cent, the blood of a man does not take up enough of the gas to cause distress unless the man breathes such air a long time. If the air contains larger proportions, the blood sooner or later reaches that stage of partial saturation with carbon monoxide that produces helplessness.

The experience of those who have been partly poisoned by carbon monoxide seems to teach that usually much pain or distress does not precede collapse. One of the first symptoms is weakness of the limbs and dimness of eyesight. For some time

after resuscitation, however, there may be severe headache, or even epileptic seizures and other serious ailments.

Poisoning by carbon monoxide can take place very suddenly. For instance, a man in a mine may quickly pass from a place containing such a small quantity of the gas that he has experienced no distress, into a place containing a larger quantity, where, because of the already partially saturated condition of the blood, he will quickly succumb. Also the action of the poison may be accelerated by increased exertion, such as climbing a steep incline or ladder, or lifting heavy weights.

Symptoms of Acute Poisoning

As before stated, one of the first symptoms of acute poisoning from carbon monoxide gas is muscular weakness, headache, nausea and vomiting, which is soon followed by great drowsiness, unconsciousness, violent convulsions, and coma, frothing at the mouth, accompanied with swelling of the tongue, bulging of the eyes, and marked cyanosis. Primarily the heart beats slowly, but later becomes rapid, feeble and imperceptible, at the wrist. Death results practically from asphyxia, or want of oxygen.

A peculiar feature of gas poisoning is the fluctuation of symptoms; the patient frequently rousing for a time and being able to recognize friends or talk intelligently, only to again lapse into unconsciousness or be seized with convulsions. Prolonged coma of several hours or days duration is not unusual and recovery may follow. In cases where the comatose condition is prolonged, the patient develops an irregular type of fever, varying from 100° to 104° or 105° . On recovery the patient may suffer with headache, mental weakness, loss of memory, etc.

Treatment of Acute Poisoning from Carbon Monoxide Gas

Illuminating gas contains from 5 to 10 per cent of carbon monoxide, to which it owes its deadly effects. The treatment, therefore, is the same. The following rules for treatment of poisoning from illuminating gas have been adopted, after careful experiments, by the United Gas Improvement Company of Philadelphia, which are inserted herewith by permission:

When persons are affected by illuminating gas, they are in one of three classes:

Class I.—Those slightly affected [headache, dizziness, and nausea, but still entirely conscious].

Class II.—Those seriously affected, but still breathing.

Class III.—Those apparently dead—not breathing.

To properly treat these three classes, it is important to have on hand the following materials:

- (a) Effervescent phosphate of soda.
- (b) Aromatic spirits of ammonia.
- (c) A bottle of ordinary ammonia, with sponge attachment; or capsules of vaporole aromatic ammonia.
- (d) A tin cup.
- (e) A pair of tongue pliers.
- (f) A small wooden jaw block.
- (g) A towel.

Class I

Symptoms.—Those slightly affected, complaining of headache, dizziness, nausea or vomiting, and great drowsiness; with relaxation of the muscles, hurried breathing, and rapid heart action.

Treatment.—Take patient immediately into fresh air, loosen collar and open shirt, at the same time walking him around. Give one heaping teaspoon of effervescent phosphate of soda in a glass of water and follow it in five minutes by one-half teaspoonful of aromatic spirits of ammonia in a third of a glass of water. This latter dose may be repeated every fifteen minutes for not more than four doses. Walk patient around until he recovers; then watch him, as he may have a sinking spell, in which event the same treatment must be repeated.

Effervescent phosphate of soda is given to overcome the nausea, and to act on the patient's bowels. However, if it is not obtainable, plain soda water will answer.

Aromatic spirits of ammonia is given as a stimulant for the heart and lungs, both of which are weakened by the effects of gas. In walking the patient, two men should support him, with one of his arms around the neck of each.

If the patient appears to be unable to assist in walking, drags his feet, or acts as if he were becoming more and more exhausted, and is difficult to arouse, such symptoms indicate the patient is more profoundly affected and properly belongs to Class 2. The efforts to arouse him should therefore cease and he should be placed in the prone position and treated as follows:

Class II

Symptoms.—Those seriously affected, but still breathing. The patient is apparently partially conscious or unconscious—very weak and his breathing is rapid and weak.

Treatment.—Carry the patient immediately into fresh air. In this class of cases he is too weak to walk, and is unable to swallow. Place him on his back on a flat surface, with a coat rolled (not folded) under the shoulders and neck, in such a way as to allow the head to fall backward enough to straighten the windpipe; at the same time open the shirt wide at the neck, loosen the trousers and drawers at waist, and have two assistants rub his leg and arms hard. The sleeve and trouser-legs should be rolled up as far as possible, so that the rubbing may be done on the bare skin and from the extremities toward the body. Friction thus applied is a stimulus to the blood circulation.

If he becomes conscious enough to swallow, give him a half teaspoonful of aromatic spirits of ammonia in a third of a glass of water. This dose may be repeated every fifteen minutes for not more than four doses. If unconscious, open his mouth, forcing the jaw if necessary.

NOTE.—If the jaw is rigid, it can be forced open by placing the forefingers back of the bend of the lower jaw bone and the thumbs of both hands on the chin, pulling forward with the fingers and pressing jaw open with thumbs.

Place the jaw block, or something similar, between the teeth to keep the jaws open and prevent the patient from biting his tongue, using something large enough to prevent any danger of his swallowing it accidentally, and grasp his tongue with the tongue forceps and draw it forward.

Clear froth from the mouth by putting in your forefinger as far as possible, and bringing up the froth with a scooping motion. Have the assistant who is holding the tongue, slowly pass the bottle of ammonia with the sponge attachment or the vaporole aromatic ammonia under the patient's nose about once a minute, as the patient breathes and inhales the remedy.

Help the patient to breathe by pressing the base of the ribs together every other time he breathes out. Do not press vertically, but press on the patient's sides (palms of hands over lower ribs) in such a manner as to force as much air out of the lungs as possible. You can carry out this pressing action most successfully if, on beginning, you move your hands in and out with every breath, pressing very lightly until you have established a rhythmical motion of your hands in unison with the patient's breathing; then you can begin to press hard at every other outgoing breath.

Continue this pressing action until the man is conscious and breathing well by himself.

The rubbing of the arms and legs, the holding of the tongue, and the passing of the ammonia under the nose, should be continued as long as the pressing action is necessary. After he is conscious, give him a half-teaspoonful of aromatic spirits of ammonia in a third of a glass of water. After you have brought him around, shift the coat or pillow from under his shoulders to under his head and apply artificial heat, and cover him with a blanket.

Class III

Symptoms.—Those apparently dead—not visibly breathing. Carry the patient immediately into fresh air. Open the shirt, and prepare patient as directed in Class II, clear the froth from mouth as above directed, then place the patient flat on his stomach, the head turned to one side so that breathing through both the mouth and nose will not be interfered with. Have your assistant who is holding the tongue, slowly pass the ammonia under the patient's nose once a minute, when the patient is drawing in his breath.

Artificial respiration should now be commenced as early as possible by means of the lungmotor or the method above described. Administer a hypodermic of strychnine, one-thirtieth grain, and while artificial respiration is being performed, apply friction and artificial heat to the body. Should the patient become conscious, give him a half teaspoonful of aromatic spirits of ammonia in a third of a glass of water. Then cover him with a blanket.

All efforts at resuscitation should be continued at least one hour. Cases are known where patients showing no signs of life, after an hour's work, have recovered, and the recovery was due entirely to the faithful persistence of those in charge.

Special Treatment

In all pronounced cases of poisoning from monoxide, illuminating gas, or other noxious gases, especially where there is marked cyanosis and low blood pressure, and regardless of the degree of unconsciousness on the part of the patient, artificial respiration is often essential to recovery. The lungmotor with oxygen should be employed and at the same time phlebotomy should be performed. The vein at the elbow is usually the most convenient, a cannula should be introduced into the vessel and secured by a ligature. Ten to twelve ounces of blood may be withdrawn or massaged from the vein, if flow is sluggish, and before removal of the cannula twelve to twenty ounces of warm saline solution should be slowly introduced into the vein. The saline so given, not only acts as a diluent, but tends to dilate the vessels, increases blood pressure and hastens elimination through the kidneys and skin.

Sajous, Da Costa, and others commend the addition of adrenalin, 10 minims of a 1:1000 solution, to a pint of warm saline solution, not wholly because it tends to promote energetic heart action, but for its catalytic effect in increasing the intake of oxygen and its utilization by the tissue cells. Ten- to 15-minim doses of

adrenalin may also be of material benefit administered hypodermically at intervals of thirty minutes until reaction is established. Atropine, $\frac{1}{100}$ grain subcutaneously, aids also in the restoration of the circulation by causing the arterioles to assume their functional tone, and reestablishment of the *vis a tergo* of the blood to the capillary system.

The Subcutaneous Administration of Oxygen

Dr. John McCrae, of Montreal, has very recently experimented with and highly extols the subcutaneous administration of oxygen, and considers it especially applicable to those cases where respiration is markedly interfered with, asphyxia from illuminating gas, electric shock, prolonged anesthesia, etc. His method is as follows:

An ordinary tank with oxygen at high pressure is used, a simple rubber tube being used for outlet, with a moderate-sized hypodermic needle at the end. The apparatus is cleaned, the needle sterilized; tincture of iodine is painted on the skin over any part of the body where the tissues are lax, and the rate of flow having been determined as not too slight nor too great, the needle is plunged into the skin, and a large area of oxygen emphysema, which may be as large as half a football, is raised in a few—perhaps thirty—seconds, or more slowly if desired. It is not necessary to filter the gas through water. In critical cases, three or four such injections may be made in various parts of the body, and repeated as often as desired. The absorption occurs very quickly, but emphysema is apparent to the fingers for a few hours, and to the stethoscope for a day or more. Pain is not complained of, and the success of the method as a means of stimulation is sometimes quite striking.

Should the foregoing methods prove ineffectual in restoring the individual, the direct transfusion of blood as practiced by Crile promises to be of great service and is not only applicable to gas poisoning, but is especially effective after severe hemorrhage from any cause. This method as finally approved by Crile and Lénhart is described herewith in full.

CRILE'S METHOD OF DIRECT TRANSFUSION OF BLOOD IN ASPHYXIA FROM GAS AND SMOKE

Surgical Principles

The vascular systems of two individuals are united so that the intima comes in contact only with intima. This is accomplished by the Carrel suture or by a special anastomosis tube, which is the method of choice, so that the blood may be transferred without clotting; that the use of the radial artery of the donor and any superficial vein of the recipient yields the best results; that the operation may be done painlessly; that the blood lost by the donor is regained in from four to five days; that the amount transferred is under the immediate control of the operator; and that the rate of transference should be carefully gauged because of the risk of overcharging the pulmonary circulation.

Clinical Technic

In the clinical transfusion the radial artery of the donor and the proximal end of any superficial vein of the arm of the recipient have been used. The radial artery is chosen because it is easily isolated and may be readily adjusted to the position of the vein of the recipient. Unless contraindicated, the donor and the recipient are both given a hypodermic injection of morphine twenty minutes before the transfusion. Before they enter the operating room, after their arms are prepared, and for the purpose of minimizing the psychic factor, a nurse places over their eyes a wet towel with the diverting explanation that the eyes must be protected from the bright light to prevent headache.

The donor is placed upon an operating table of the Trendelenburg type, so that should he faint the head may be readily lowered. The recipient is also placed upon an operating table with his head in the opposite direction from the donor. By the use of an infiltration anesthesia of 0.1 per cent solution of novocaine, about 3 centimeters of the radial artery are exposed and the smaller branches tied with very fine silk; a Crile clamp is applied to the proximal end of the artery and the distal end is ligated; the artery is then divided; the adventitia is pulled over

the free end as far as possible and closely snipped off; a moist saline sponge now covers this field; 3 or 4 cm. of a superficial vein of the recipient are then likewise freed; the distal part ligated, the proximal closed with a Crile clamp; the distal part is divided with scissors, the adventitia drawn out as far as possible, and closely snipped off; the vessels are then inspected and a cannula whose bore is larger than the actual tissue thickness of either vein or artery is selected. The vein may then be pushed through this tube, after which the freed end is turned back like a cuff and snugly tied in the second groove.

During this time the handle of the cannula is steadied and manipulated by means of a forceps. If the artery is small or atheromatous and, therefore, firmly contracted, or if it is contracted for any other reason, its lumen may be dilated by means of a "mosquito" hemostat pushed into the lumen and gradually opened. The artery is then drawn over the vein and is snugly tied with a small linen ligature in the first groove. This completes the anastomosis.

The clamp is then removed from the vein, afterward gradually from the artery, when the blood stream will be seen to pass from the artery across to the vein, dilating the latter. However, the exposure and manipulation of the vessels, especially the artery, causes sharp retraction. The artery may contract so firmly as to obliterate its lumen. The constant application of warm saline solution and protection from the air will help materially in bringing about relaxation and, hence, a larger stream of blood. The pulse valve may be palpated in the vein. It is best to introduce the blood very slowly, watching the result carefully.

RESUSCITATION FROM ELECTRIC SHOCK*

The electric current may kill either by temporarily paralyzing the nervous control of the muscles of respiration, or by stopping the regular beat of the heart. When the heart is seriously affected, it ceases to contract as a whole, but continues to contract in parts here and there, so that it appears to quiver. It is then said to "fibrillate." In this condition the heart fails to keep the blood circulating and death quickly results.

*Excerpt, by permission, from methods adopted by the National Electric Light Association, New York City.

Hope of resuscitation is restricted to proper treatment of the cases of paralyzed respiration; and since deprivation of oxygen for about ten minutes injures irremediably some of the nerve centers of the brain, it is particularly important that measures for resuscitation be applied immediately, and continued until natural breathing returns. In some instances, however, the heart may be merely weakened without being made to fibrillate; in such cases artificial respiration may be of vital importance, because a greatly weakened heart leads to impairment or total stoppage of respiration, which, in turn, destroys the last vestige of the heartbeat.

Method of Removal from Contact with Live Wire

Follow these instructions even if victim appears dead.

1. With a single quick motion separate the victim from the conductor. In so doing avoid receiving a shock yourself. Many have, by their carelessness, received injury in trying to disconnect victims of shock from live conductors.

OBSERVE THE FOLLOWING PRECAUTIONS

- (a) Use a dry coat, a dry rope, a dry stick or board, or any other *dry nonconductor* to remove either the victim or the wire, so as to break the electric contact. Beware of using metal or any moist material. The victim's loose clothing, if dry, may be used to pull him away; do not touch the soles or heels of his shoes while he remains in contact—the nails are dangerous.

- (b) If the body must be touched by your hands, be sure to cover them with rubber gloves, mackintosh, rubber sheeting or dry cloth; or stand on a dry board or on some other dry insulating surface. If possible, use only *one* hand.

If the victim is conducting the current to ground, and is convulsively clutching the live conductor, it may be easier to shut off the current by lifting him than by leaving him on the ground and trying to break his grasp.

2. Open the nearest switch, if that is the quickest way to break the circuit.

3. If necessary to cut a live wire, use an ax or a hatchet with a dry wooden handle, or properly insulated pliers.

Treatment for Electric Shock

An accidental electric shock usually does not kill at once, but may only stun the victim and for a while stop his breathing. The shock is not likely to be immediately fatal, because:

(a) The conductors may make only a brief and imperfect contact with the body.

(b) The skin, unless it is wet, offers high resistance to the current.

Hope of restoring the victim lies in prompt and continued use of artificial respiration.

Persons whose breathing has been stopped by electric shock have been reported restored after artificial respiration has been continued for approximately two hours.

In the absence of the lungmotor, the Schäfer, or "prone pressure," method of artificial respiration has been selected or recommended by the National Electric Light Association. This method is illustrated and described in the treatment of asphyxia by drown-



Fig. 50.

ing, but as a matter of convenience here, it may be summed up briefly as follows:

As soon as the victim is clear of the live conductor, quickly feel with your finger in his mouth and throat and remove any foreign body (tobacco, false teeth, etc.). Then begin artificial respiration at once. Do not stop to loosen the patient's clothing; every moment of delay is serious.

Lay the subject on his abdomen, with arms extended as straight forward as possible, and with face to one side, so that the nose and mouth are free for breathing. Let an assistant draw forward the subject's tongue. If possible avoid so laying the subject that

any burned places are pressed upon. Do not permit bystanders to crowd about and shut off fresh air.

Kneel straddling the subject's thighs and facing his head; put the palms of your hands on the loins (on the muscles of the small of the back), with the thumbs nearly touching each other, and with fingers spread over the lowest ribs. (See Fig. 50.)

With arms held straight, swing forward slowly so that the weight of your body is gradually brought to bear upon the subject. (See Fig. 51.) This operation, which should take from two to three seconds, must not be violent—internal organs may be injured. The lower part of the chest and also the abdomen are thus compressed, and air is forced out of the lungs.

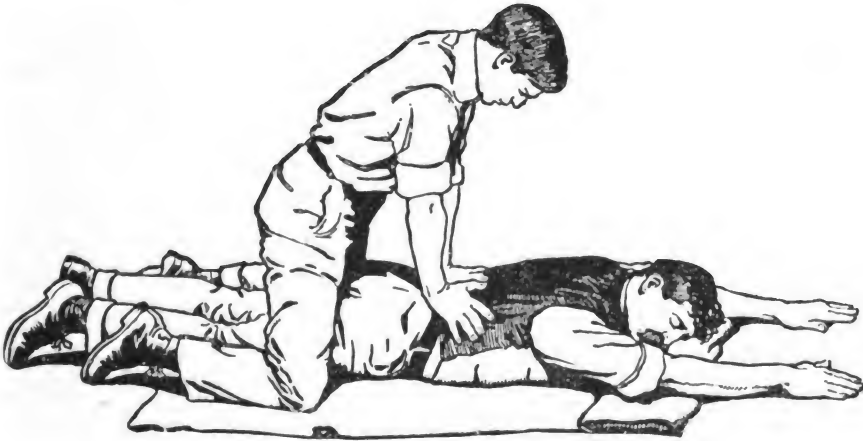


Fig. 51.

Now, immediately swing backward so as to remove the pressure, but leave your hands in place, thus returning to the position shown in Fig. 50. Through their elasticity, the chest walls expand and the lungs are thus supplied with fresh air.

After two seconds swing forward again. Thus repeat deliberately twelve to fifteen times a minute the double movement of compression and release—a complete respiration in four or five seconds.

Medical Treatment

While artificial respiration is being carried on, hypodermic injections of adrenalin, atropine, or camphorated oil should be

given; according to Sajous, digitalis and strychnine are contraindicated. External heat in some form should also be applied early, and hot coffee by the mouth as soon as it can be swallowed by the patient.

Those experiencing an electric shock remain weak, nervous and exhausted for several days. Tonics and restoratives are, therefore, beneficial, with rest as the essential feature.

TREATMENT OF ELECTRIC BURNS

The treatment and after-care of burns from electricity differ immaterially from those caused by fire, steam, gasoline, etc.,



Fig. 52.—Severe type of electric burn.

except, what at first seems superficial or insignificant may develop marked sloughing and extend over a considerable area. Electric burns also heal much slower and the patient should be so informed. The prognosis should be somewhat guarded until the extent of the burned tissues may later be determined. (Fig. 52.)

Where the physician is called early to these cases and the clothing adheres to the burned area, it is usually better to cut away the clothing leaving the adherent part, which later should

be saturated with hydrogen peroxide or some bland sterile oil (albolene, pure olive, etc.) and very gently removed. Absorbent cotton should never be applied directly to burned surfaces, on account of its tendency to adhere so tenaciously to the parts involved. Sterile gauze or lint is, therefore, much to be preferred.

As an emergency remedy a strong aqueous solution of sodium bicarbonate applied freely on sterile gauze and kept wet, is often of marked value. The solution should be applied comfortably warm.

Where the skin is charred or badly burned, phenol one part to thirty of liquor calcis, or one to six of olive oil (Potter) speedily relieves pain and promotes healing without suppuration; or some preparation of paraffin melted and applied by means of a spray or brush, as more fully described under the treatment of burns and scalds, is regarded at the present writing as eminently the most satisfactory.

LIGHTNING

The effect of a lightning stroke upon the human body varies greatly in accordance with the amount or force of the electric current received. When the stroke has been sufficient to cause immediate death, the body may present marks, contused or incised wounds, or fractures, indicative of great mechanical violence. Abortion, fractures of the skull, ankle and femur have been reported. The skin is frequently discolored, burned, denuded, or streaked. The effects of the zig-zagging course of the electric current, or the red streak, may encircle the body, arms or legs, like the red line of a barber's pole. The effect of lightning is identical with the commercial electricity of high voltage. The patient falls into a state of unconsciousness, and if the stroke is not immediately fatal, the insensibility is accompanied by deep, slow respiration, relaxation of the muscular system, the pulse soft and slow, pupils dilated, but insensible to light. Many who recover from a stroke of lightning complain of a numbness or prickling sensation and ringing of the ears. Loss of sight, deafness, loss of taste, or smell, and other local forms of paralysis, very frequently follow a lightning stroke. Convulsions are not uncommon, and insanity may likewise result from a severe stroke.

Death results from changes in the nervous system, or minute hemorrhages within the cord or brain, which cause paralysis of the heart or respiratory centers.

Treatment

The patient should be placed in a recumbent position. External applications of heat are usually essential to preserve bodily temperature. Amyl nitrate by inhalation is often indicated, which action should be sustained with the internal administration of aromatic spirits of ammonia, one-half to one teaspoonful every hour, in hot water, as indicated. Prolonged and continuous efforts at artificial respiration are often required for several hours. Rectal enemas of hot saline solution and the intravenous injection of alkaline solutions, carbonates of sodium, etc., have been highly extolled, especially after phlebotomy in patients of a plethoric nature.

SUFFOCATION

Suffocation from being suddenly buried in dirt, grain, wheat, barley, etc., differs in no way from asphyxia due to other causes, except some of the foreign substance may be drawn into the pharynx, larynx, or trachea. Artificial respiration should never be attempted until the respiratory tract is clear of all foreign substance. A harsh, high-pitched, respiratory sound, like the whistling of wind (stridor) is always indicative of obstructive dyspnea, and calls for prompt clearance of the throat, or air passages. In many instances tracheotomy must be early resorted to in order to save the life of the patient. The respiratory tract clear of obstruction, artificial respiration with oxygen should be commenced as soon as possible. Hypodermics of adrenalin, alternating with 20 to 30 minims of camphor water may likewise be used with benefit. Artificial heat is also required and later hot saline enemas and alcoholic stimulants should be used to relieve and sustain the patient.

Suffocation from Smoke

Smoke is a violent irritant to the eyes, throat, and mouth. The first symptoms of suffocation in consequence of exposure to

smoke from fire or burning wood, etc., are choking, blindness, headache, vertigo, ringing in the ears, and muscular exhaustion. The respiration becomes shallow and rapid, and the patient soon becomes unconscious. Cyanosis is always marked, the eyes suffused and protruding, venous engorgement is general and perspiration covers the skin. Epistaxis is common, the tongue often protrudes, and the patient froths at the mouth. Involuntary evacuation of bowels and urine frequently occurs, and if the patient is strong and healthy, the heart, while rapid and weak, may continue to beat for some time after the absence of pulsation at the wrist.

TREATMENT

The patient should be placed in a recumbent position in the fresh air; artificial respiration with oxygen should be instituted at the earliest possible moment. The lungmotor is of especial value in this class of cases, and while it is being used the patient should be rubbed dry, the body and extremities roughly massaged and wrapped in hot dry blankets. Atropine $\frac{1}{100}$ grain, followed at short intervals by aqua camphor, 20 to 30 minims, hypodermically, are the most useful heart stimulants. When the heart action improves and patient seems stronger, gastric lavage, if rapidly performed, is of great advantage; and before removal of the tube, hot coffee or hot water should be given to stimulate the action of the stomach and kidneys. Artificial respiration must be continued until the patient is fully restored to consciousness and breathing is regular and normal, after which a hot general bath is very efficient and soothing; following which the patient should be kept at rest in a warm bed with abundance of fresh air. The conjunctivitis is best treated with the following very soothing ointment prepared for ophthalmic use:

- R Ointment yellow oxide of mercury 1% with adrenalin.
Sig.: Apply freely to the eyeball every two or three hours.

Should a solution seem preferable, use:

- | | | |
|---|---|-------------------|
| R | Zinc sulphate | gr. ii |
| | Morphine sulphate | gr. $\frac{1}{4}$ |
| | Distilled water | \mathfrak{ss} i |
| | M. | |
| | Sig.: Use freely as an eye water every 2 hours. | |

and compresses moistened with a saturated solution of boric acid in camphor water applied at frequent intervals.

Suffocation from Hanging

Death from hanging results usually from asphyxia. The rope or constriction used ordinarily encircles the neck between the larynx and hyoid bone. The head is inclined forward, and as a consequence, the chin approaches the chest. The groove made by the rope or constricting cord is usually well marked on the skin of the neck.

If the face is especially cyanotic and shows numerous punctiform ecchymoses of the skin of the eyelids and surrounding parts, the conjunctiva noticeably congested, the tongue swollen and protruding from the mouth and a bloody serum exuding therefrom, in the absence of pulse at the wrist, all indicate that the body has been hanging for at least several minutes, and if, on being released from the constricting band and lowered to a recumbent position, the cyanosis does not disappear, it is an indication of dissolution, and that respiration has been so interfered with and the larger vessels of the neck so compressed, that recovery will be impossible.

Fracture of the larynx or hyoid bone, thyroid or cricoid cartilages; rupture of the sternocleidomastoidens and the other muscles are not uncommon, and dislocation of the neck may also occur, especially in a fall of several feet.

TREATMENT

If the physician is satisfied there is no serious injury to the larynx, etc., artificial respiration with oxygen should be employed as early as possible, and continued until respiration is established. Gastric lavage followed by hot coffee and a hot general bath are desirable features in the restoration of the patient.

SEWER GAS POISONING

The poisonous effects of sewer gas, or gas from privy vaults, cesspools, etc., are usually due to hydrogen or ammonium sulphide. The individual is suddenly seized with muscular weakness

or exhaustion, nausea and vomiting, labored breathing and irregular heart action. These symptoms are frequently accompanied with abdominal pain and violent titanic convulsions, preceding pronounced coma, death often occurring without the return to consciousness.

Treatment

Artificial respiration with oxygen should be maintained until the patient breathes naturally and returns to consciousness. If cyanosis is marked, venesection should be performed, followed by intravenous saline solution, or Crile's transfusion of blood. In the presence of poisoning from the sulphides, gastric lavage followed by a solution of one ounce of magnesium sulphate should be given to assist in the elimination of the poison.

The patient should be wrapped in warm blankets and otherwise treated symptomatically.

AMMONIA GAS POISONING

Ammonia gas or vapor is considered one of the most common and dangerous poisons. In small amounts the vapor is extremely irritating, and may occasion severe bronchitis, with possibly edema of the lungs and glottis. When taken internally, ammonia water often causes symptoms of pronounced poisoning, and if death is not immediate, symptoms of severe gastroenteritis ensue, with severe abdominal pains and spasms, accompanied by stupor or delirium; which may be followed by collapse, coma, and death, the effects of swallowing strong solutions of ammonia being the same as those occasioned by other fixed alkalies, except they are more severe and rapid in their action. Two ounces of a strong solution of liquid ammonia, according to Taylor, has been sufficient to cause death, but cases are on record where persons have survived after swallowing several ounces. Inhalation of ammonia gas is excessively poisonous. Hamilton mentions the case of three men exposed to the gas for about three minutes, caused by the overturning of an ammonia ice machine; one became unconscious and comatose, and died in three minutes. The second was delirious and unconscious as from chloroform, and died in two hours; the third was conscious and able to

walk home, but died suddenly in an attack of dyspnea in five hours.

The after effects from the inhalation of ammonia gas are inflammation of the mucous membrane of the nose, mouth, pharynx, larynx, and bronchi. The conjunctiva may also be inflamed, and prolonged exposure produces ophthalmia.

Treatment

In poisoning from the vapor of ammonia, if pronounced, artificial respiration with the forcible introduction of oxygen into the lungs should be resorted to early. If there is marked cyanosis and evidence of venous stasis, venesection followed immediately by intravenous injection of 8 to 10 ounces of normal salt solution is sometimes followed by surprisingly good results.

In the absence of the ordinary Kelly apparatus or bottle, hypodermoclysis may be rapidly performed by using a large hypodermic needle attached to an ordinary fountain or bulb syringe. The needle should be introduced under the skin under the breast or near the base of the scapula. Twelve to 16 ounces of sterile normal salt solution should be employed when indicated.

If aqua ammonia has been taken into the stomach, the poison may be neutralized with vinegar or lemon juice, followed by infusions of hot coffee, milk, oil, or bland liquids. Bodily temperature should be maintained with artificial heat, and digitalis and adrenalin hypodermically administered to sustain the circulation. Tonics and restoratives will be required for several days.

CHAPTER IV

SURGICAL EMERGENCIES

SURGICAL SHOCK

Shock may be defined as a condition of vital depression due to a profound impression made on the cerebrospinal axis or nerve centers through the agency of the afferent nerves, or circulatory medium. Every injury, however slight, may be followed by surgical shock, and all extensive cut or lacerated wounds, compound fractures, crushing injuries, gun shot wounds, severe burns and scalds, may be named as among the most frequent injuries followed by more or less shock.

Mangling of the arm or upper extremity does not cause such profound shock as a crushing injury of the leg or lower extremity, and the nearer the injury approaches the trunk, the graver is the subsequent shock. Open wounds of the larger joints, knee, hip, and shoulder, falls from a height, or blows upon the abdomen, are sometimes followed by fatal shock, with or without hemorrhage. It may be stated in conclusion that the greater or more extensive the injury, the greater will be the shock, and in burns and scalds the degree of shock depends more on the extent of skin invasion and site of the burn than the depth. There is a form of shock known as psychic or emotional. Shock of this character has a wide limit. Pronounced or even fatal shock may result from sudden fright, excessive joy, grief, or anger. To this class belong those cases occurring in neurotic individuals of so-called "railroad" shock, in which no injury whatever is sustained, but the dread or fear of impending injury so disturbs the equilibrium of the nerves as to render the individual unconscious or helpless for some time. The great majority of these cases should be classed as functional or hysterical. Elderly people suffer more from shock than the middle-aged, and children suffer less in proportion to adults, although they do not bear the loss of blood well.

Hemorrhage adds greatly to the fatality of shock, and in many cases fatal collapse may justly be attributed to hemorrhage alone.

Symptoms

The usual symptoms of shock are pallor, sighing respiration, rapid pulse, clammy moisture of the skin, subnormal temperature, greatly reduced blood pressure, with nausea and vomiting and other evidences of exhaustion. In profound shock there is always more or less dyspnea, and the facial expression is usually characteristic. The eyes are shrunken and lose their luster, the chin drops so that the mouth is partly open, the lips, face, and finger nails become blue or cyanotic, and unless reaction occurs, death results from collapse.

Treatment

The patient must be placed in the recumbent position, and made as comfortable as possible. If the shock is due to a severe crushing injury, morphine $\frac{1}{4}$ to $\frac{1}{2}$ grain with atropine $\frac{1}{150}$ grain should be given hypodermically as soon as possible. The patient's bodily heat should be maintained by external warmth. The author has had recently most excellent results in severe shock due to railroad injury, with pituitrin. The extract given in one cubic millimeter repeated in one-half hour seems to act more quickly than adrenalin, and is especially valuable in maintaining the rise of blood pressure following saline infusion. In collapse due to hemorrhage, the intravenous injection of normal salt solution is often very efficacious, but in less urgent cases the saline solution may be administered by hypodermoclysis or by proctoclysis.

Intravenous injections of from 8 to 16 oz. of a properly sterilized normal salt solution, slowly introduced through the medial basilic vein at the elbow, is a very simple and safe procedure of very marked value, not only after exhaustive hemorrhage or surgical shock, but also in toxic conditions following certain acute diseases.

The Murphy method of the administration of salt solution (proctoclysis) is as follows:

Proctoclysis

The employment of proctoclysis in the treatment of all forms of exhaustion and general toxemic conditions is a very simple

procedure; but, unless given with appreciation of the principles involved, the solution will not be retained by the patient. The continuous method is by far the most scientific and successful. The retention of fluid in the colon depends entirely on its method of administration. Moderate distention is the normal condition of

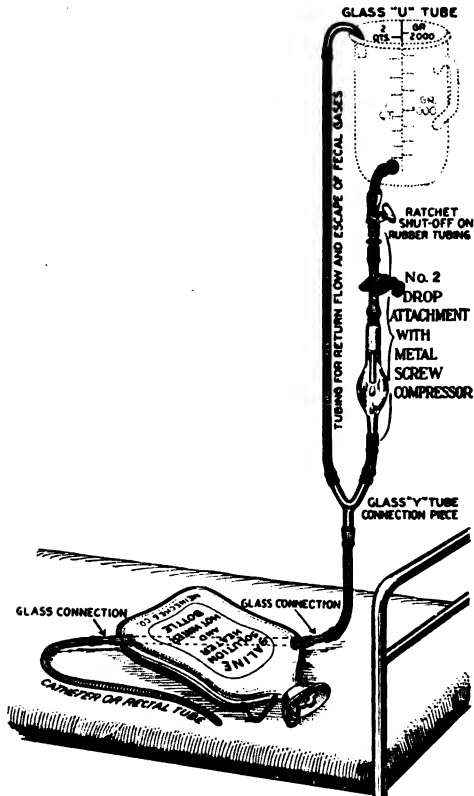


Fig. 53.—Meinecke's hypodermoclysis apparatus.

the large intestine. Its mucosa absorbs water with great rapidity. If it is hyperdistended, it causes spasm and expulsion of material. The results obtained by this treatment have been surprising, and are now so uniform as to amount almost to a mathematical certainty when the details are carried out, which are based on

our knowledge of the physiologic and pathologic conditions of septic absorption, local and constitutional immunity, and the elimination of toxins.

The apparatus in its simplest form consists of a fountain syringe or can, with a large rubber tube attached, terminating in a vaginal



Fig. 54.—Meinecke drop attachment.

hard rubber or glass tip, flexed at an obtuse angle two inches from its tip, having numerous openings in its bulbed end. Or, the much more convenient Meinecke apparatus may be used for this purpose. (See Figs. 53 and 54.) The tip should be inserted into the rectum so that the angle fits closely to the sphincter, and the tube may then be bound firmly to the thigh with adhesive strips so that it may not be expelled.

The quantity administered depends on the severity of the case, the age of the patient, and other considerations that will suggest themselves to the particular instance. For the purpose of mere stimulation and elimination, four to six quarts are usually sufficient, and should be given at a temperature of 105° to 108° . The average amount, however, in the treatment of peritonitis, is eighteen pints in twenty-four hours; that is, a pint and a half

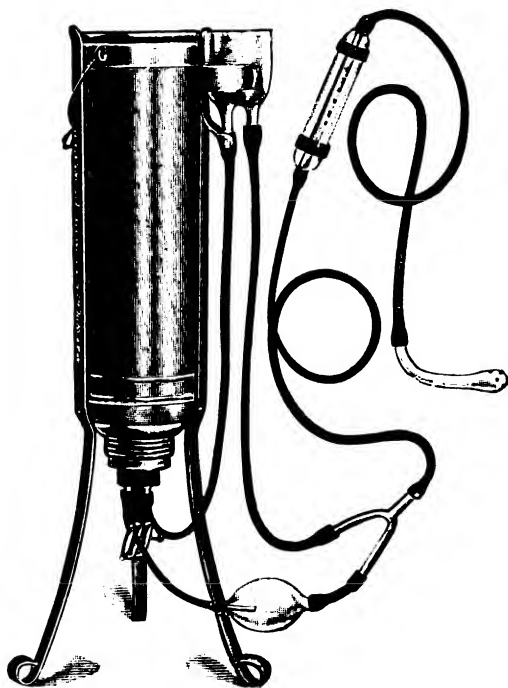


Fig. 55.—Murphy-Magnuson's saline solution apparatus.

every two hours. A quantity less than eight pints is of little value. In a child of eleven as much as thirty pints have been administered in twenty-four hours, without escape of fluid.

The control of the flow should never be governed by knots in the tube, forceps clamped thereon, or small openings in the tip. The larger tube with many openings is used to provide for a sudden return of the flow into the can when the patient strains or wishes to expel fluid or void gas. If there be constrictions in

the tube, the fluid can not return into the can, but passes into the bed linen.

In emergency cases the proctoclysis is usually continued for from three to six hours, or until reaction occurs. It is best administered in the Fowler position. The best plan is to place a pint and a half of the saline solution in the container every two hours. The container should be elevated sufficiently to allow this all to flow into the rectum in forty to sixty minutes, giving the rectum a period of rest from the influx or fresh fluid for approximately an hour before it flows again.

It is surprising what a large quantity of fluid is taken up by the rectum, and how little irritation and disturbance it produces, even in days of continuous use. If the patient is getting too much solution, after the third or fourth day, he will show a slight edema of the ankles, hands, and even of the face. Then it should be discontinued until his circulatory equilibrium is restored, when the treatment may be repeated if indicated.

In the toxemias of typhoid, scarlatina, and in the early days of pneumonia, before the heart has suffered from the intoxication, proctoclysis appears to afford great relief. In the later stages of pneumonia it should be used with great caution.

WOUNDS

General Consideration

Wounds, for convenience in description, may be classified as incised, or clean cut; lacerated, or torn; contused, or bruised, and punctured, or penetrative, in character.

INCISED WOUNDS

Incised wounds, accidental or intentional, are made by a sharp cutting instrument,—knife, razor, glass, etc. The cut surfaces are smooth, bleed freely, and the extent of the injury can usually be determined by inspection and palpation. Foreign substances are not so liable to be driven into the tissues, or, if present, may readily be detected and removed. In many instances the free bleeding acts mechanically in the removal of infectious sub-

stances. In incised wounds where accurate apposition of the tissues can be accomplished without too much tension, under proper asepsis healing may be expected by first intention.

LACERATED WOUNDS

Lacerated wounds are caused by the tearing asunder of the tissues, as frequently noted in machinery accidents, injuries from



Fig. 56.



Fig. 57.

Figs. 56 and 57.—Crushing injuries of feet sustained beneath car wheels. Crushing disarticulation through tarso-metatarsal joint. In the upper plate (Fig. 56) the lower portion of the foot is not completely severed though the tissues are so thoroughly mangled that the circulation is destroyed and amputation is necessary. In the lower plate (Fig. 57) the lower portion of the foot was completely severed at the time of the accident. (Preston.)

explosives, railroad injuries, bites of animals, etc. All such wounds have a ragged, irregular outline. The fascia and tissues yield at the place of least resistance, hence the injury to the blood

vessels, nerves, or muscles may not be confined to the seat of trauma, and may be far more extensive than first appearance may indicate. Extensive lacerated wounds are accompanied with more or less contusion of the adjacent tissues, dirt and grease, bits of clothing and other infectious material are likewise to be expected in this class of cases and great care must be taken to prevent suppuration and septic complications.

CONTUSED WOUNDS

Contused wounds result from the direct application of a blunt force at the place of injury. A simple contused wound is one in which the tissues are more bruised than separated. A severe contusion does not necessarily imply a torn or lacerated skin, since the injury may be so extensive as to crush and destroy subcutaneously the nerves, arteries, muscles, or the bones directly involved. Extravasation of blood is also common to this class of injuries as noted in certain machinery accidents, railroad bumper injuries, blows from a heavy blunt instrument, kick of a horse, etc.

PUNCTURE WOUNDS

Small penetrating wounds, such as made by bullets, stab wounds, barbed wire, pitch fork, needles, nails, glass splinters, dog bites, snake bites, etc., are characterized by small skin openings. The position of the wound must be noted, since stab wounds of the neck, chest, or abdomen, if made by a sharp knife or scissor blade over the course of a large artery, may cause serious hemorrhage which should not be mistaken for mere surgical shock. With the exception of stab wounds, punctured wounds are rarely accompanied with hemorrhage, but all surgeons now agree that infection of a serious character *is more liable to follow punctured wounds* than any other like injuries. The wound may appear insignificant and the difficulty of properly cleansing and disinfecting the deep tissues without free incision, *is an impossibility*. In the light of modern surgery, bullet wounds should not be probed and no attempt at removal of the ball should be made until all danger of sepsis has passed; operative interference being justifiable only in case of profuse hemorrhage or when complicated visceral lesions demand. If infection should follow a punc-

tured wound, early incision and drainage under general or local anesthesia is essential to prevent diffuse abscess.

Modern Treatment of Wounds in General

The first step in the treatment of any open wound is the control of hemorrhage. This may be accomplished by mere pressure with a properly applied bandage, or, if the bleeding is profuse, by seizure and ligation of vessels as described in detail under special or local wounds.

The second step is the removal of all foreign substances. The skin having been dried by means of sterile gauze, tincture of iodine should be carefully applied to all parts of the wound and adjacent skin after which the wound may be inspected and any foreign substance removed by means of sterile forceps. It is no longer considered good surgery to examine the wound with the fingers, and the employment or introduction of gauze or cotton sponges into the wound, however sterile, is also prohibited. Vigorous scrubbing with a hand brush, or the indiscriminate employment of peroxide and many so-called antiseptic solutions, however popular with the laity, together with any unnecessary handling of the injured parts, is likewise condemned as tending to increase the trauma and adding to the possibility of infection. In wounds made by metallic substances, glass, nails, needles, bullets, etc., their presence is best determined or located by means of the x-ray, after which they should be removed by forceps with as little manipulation of the soft parts as possible. The successful treatment of wounds, therefore, depends largely upon the ability of the surgeon to minimize the reparative work of the injured tissues as well as the prevention of infection and remote complications.

Disinfection of Septic Wounds

The unprecedented, if not sensational, success in the sterilization of septic wounds by the Carrel-Dakin method, has received the indorsement of English and French surgeons and is now being employed with marked results in hospital and private practice by American surgeons. It is assuredly a valuable asset to the modern treatment of wounds, since the technic of its employment

by Carrel enables the surgeon to assume greater risks in the treatment of many cases of compound fractures, open wounds, suppurating joints, and other like serious septic conditions which heretofore seemed impossible to render aseptic, and where immediate amputation was very often considered essential to recovery. Not only is the Dakin solution bactericidal, but it possesses the advantage over mercuric chloride and other strong antiseptics, of having the power to destroy pus, blood clot, and sloughing tissues; and this action, being resisted by normal tissue, is now regarded as due to the presence in the serum of sodium chloride. Dakin's solution, chemically, is a solution of sodium hypochlorite made by adding sodium carbonate to chloride of lime in suffi-

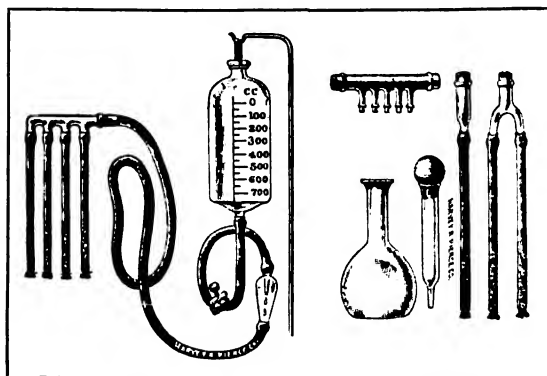


Fig. 58.—Carrel's apparatus for administering Dakin's solution.

cient quantity to overcome the caustic alkalinity thereof. The Dakin solution is distinct from all other chlorine solutions and is described by Dr. Lyle "as an ideal isotonic and wound antiseptic of high disinfecting qualities with low toxic or irritating power."

Technic of the Carrel-Dakin Method of Wound Sterilization

Dr. Carrel has devised an apparatus for introducing the Dakin solution, which closely resembles the "Murphy Drip." The main tube from the reservoir is attached to a glass distributor of one, two, three, four, or five connections. To the glass connectors are attached small perforated rubber tubes with ends tied, as shown in Fig. 58.

*A.**B.**C.*

Fig. 59.—Gunshot wound of face, illustrating repair under Carrel-Dakin method of treatment.

The skin area surrounding the wound is disinfected with a fresh 5 per cent solution of tincture of iodine, in small, or punctured wounds of suspicious character, under local or general anesthesia a free incision is made and any foreign substance present is removed. All bleeding vessels having been secured and ligated, the perforated tubing is carefully placed at the bottom of the wound and held in position by loosely placed sterile gauze. The number of tubes used is governed by the size and character of the injury. They should be inserted so that all parts of the wound may be kept bathed with the solution. The strips of gauze are very gently placed, never packed in the wound. A gauze compress is gently placed over the tubes and over this, Turkish toweling held in place by a roller bandage. The solution is allowed to flow into the wound, sufficient in quantity to fill, but not overflow, or to greatly saturate the dressings. The height of the reservoir governs and controls the force of the flow, hence where the patient complains of fullness or pain, the container must be lowered. Dr. Carrel has decided that the intermittent installation every two or three hours is preferable to constant irrigation and before completing his final dressings it is his custom to note carefully the amount of fluid it requires to fill the wound completely and ascertain whether or not the fluid reaches all parts.

In civil practice, owing to the possibility of dermatitis following the constant application of the solution to the healthy skin, especially in women and children, Dr. Carrel suggests that gauze impregnated with petrolatum be applied to the surface around the wound. The wounds are redressed daily. Bacteriologic verification of sterility is one of the fundamental features of the Carrel treatment and should be carried out if possible. Ordinary wounds require from five to eight days to become aseptic, extensively infected wounds, compound fractures, etc., require usually fifteen to twenty-five days. When cultures taken from different portions of the wound show a bacterial count of not greater than one bacterium to five fields, and this result obtained for four or five consecutive days, the wounds may be closed by suture or adhesive plaster and union by first intention may be expected.

Dichloramine-T

In order to overcome the serious obstacle of skin irritation which so frequently follows the continuous employment of aqueous solutions of the usual chlorine preparations, Dakin and Dunham recently evolved a double solvent, chlorinated eucalyptol oil as the basic solvent for dichloramine (a chlorine preparation first introduced by Kastle), and a chlorinated paraffin oil. The dichloramine is manufactured under a different process, in powdered form, and is called by them "dichloramine-T."

The chlorinated paraffin oil is employed not only for the purpose of limiting the decomposing action of the dichloramine-T, but to prevent irritation of the skin and also in order that the germicide would be slowly liberated over a period of from eighteen to twenty hours, instead of from thirty minutes to one hour, as with the hypochlorite aqueous solutions. Chlorinated paraffin oil under the name of "chlorosane" is now readily obtainable, and the addition of 100 grains to 4 ounces of the oil forms a 5 per cent solution, suitable for nasal and throat treatment. A 10 per cent freshly prepared solution is used in the treatment of open wounds and burns. The technic of its application is exceeding simple. To all extensive burns it is applied freely on lint or gauze, covered with rubber tissue to prevent absorption into the dressings and retained in position by a bandage.

"Open wounds, after careful surgical preparation, removal of devitalized tissue, and all foci of possible infection. The oil solution is applied freely, and in deep wounds the cavities are filled with the liquid. When dependent drainage exists because of the location of the wound or when it has been purposely made, the lower opening is temporarily closed with gauze and then the cavity is filled with the oil, thus covering all the wound surfaces. The dependent drainage is then reestablished by removing the gauze obstruction. The dressings are changed and oil reapplied but once in twenty-four hours." (Dakin, Walter Lee, Sweet, Hendrix, and Le Conte.)

Clinical results are such as to warrant the employment of this form of chlorine treatment in industrial accidents and crushing injuries, causing dirty and ragged open wounds.

NONPENETRATING WOUNDS OF THE ABDOMINAL WALL

These may be inflicted with sharp instruments such as a knife or a bayonet, by bullets, or by blunt instruments, in which cases the wounds are contused. The important question in all cases of wounds of the abdominal wall is whether the peritoneal cavity is penetrated, and whether, if penetrated, there is injury of the abdominal viscera. We are only dealing here with the nonpenetrating wounds of the abdominal wall. There is usually very little shock or bleeding, although the latter varies with the position and nature of the injury. Unless the wound becomes infected, and suppuration occurs, the patient soon recovers.

Treatment

Before proceeding to make a thorough examination of the wound, it is important to disinfect the wound and surrounding skin to avoid infecting the deeper tissues. This disinfection is best accomplished by the free use of tincture of iodine applied to the wound and skin without a previous washing or scrubbing. Where we have an accumulation of grease or oil within or around the wound, alcohol, gasoline, or denatured alcohol may be used on a sponge or swab to gently clean the part, but the skin must be dried or free from moisture before the application of the iodine. This accomplished, and the hands made as sterile as possible, the wound may be carefully investigated. If no opening is found penetrating the peritoneal cavity, after inserting a small gauze drain in the lowest part or angle of the wound, the muscles and skin should be carefully sutured in layers, and dressed with ordinary sterile gauze. The gauze drain should be removed in three or four days, as otherwise ventral hernia is likely to occur through small openings in the abdominal walls.

ABDOMINAL CONTUSIONS WITH INJURY TO THE INTESTINES

Rupture of some portion of the intestinal tract or some of the internal organs is not uncommon after a severe blow on the abdomen with or without any outward or visible marks of trauma.

Injury to the abdomen due to falls from a height, blows, kicks of horses or other animals, hits by clubs, or baseballs, wagon poles, overturned automobiles, or by being run over and crushed by the wheels of a wagon, have been known to cause rupture of the stomach, duodenum, intestines, liver, spleen, kidneys, besides wounds of the mesentery or omentum, causing fatal hemorrhage.

The parts of the intestines most frequently injured are the jejunum and, with nearly the same frequency, the ileum, but in severe crushing injuries, as where the abdomen is run over by the wheels of a vehicle, or crushed between the bumpers of cars, the more fixed portion of the intestines, such as the duodenum, the cecum, and the ascending colon, suffer most. The injuries to the bowels vary from a simple contusion to an extensive laceration, or a complete division of the bowel. The injuries may be limited to one coil of the bowel, or they may be multiple. When perforation occurs in any part of the small intestines, except the duodenum, the contents of the bowels pass directly into the general peritoneal cavity. The upper part of the duodenum, however, is not entirely surrounded by peritoneum, and a rupture on the posterior surface is usually followed by extravasation into the cellular tissues behind, and this leads subsequently to an abscess which may point in the iliac or subdiaphragmatic regions. These wounds with infection of the cellular tissue, are very fatal, as a rule the patient dying of septic poisoning.

Internal Hemorrhage and Intestinal Rupture

Excessive and even fatal hemorrhage may follow tears or wounds of the omentum or the mesentery without any injury to the abdominal walls. The most important point in this class of injuries is to distinguish hemorrhage within the abdomen from rupture of the intestines. The reason it is very important to distinguish between the two, is that in the case of hemorrhage, the sooner laparotomy is performed, the better is the chance for the patient; whereas, in intestinal rupture, it is considered best to wait for some recovery from the shock. In the case of hemorrhage, waiting for the recovery from shock would merely allow the bleeding to go on until operation would be useless.

At first it is very difficult to say whether the patient is the

subject of internal hemorrhage or of perforation, but in both cases he is blanched and suffering from severe depression. If the case is one of hemorrhage, while it is true he will suffer from all the indications of profound shock, yet at the same time, there will often be noticed a dullness over the front and lower portion of the abdomen, and if this dullness rapidly increases, the diagnosis of hemorrhage may be assured. It may be confirmed by a rectal, or if possible, a vaginal examination, for it is often possible to detect accumulations of fluid in the lower or most dependent portion of the abdomen by this means. These symptoms would not be met with for some hours were the case one of ruptured bowels, as the amount of intestinal contents escaping into the abdominal cavity would not be sufficient to produce any marked swelling or dullness. On the contrary, there is more likely to be a tympanitic condition from distention with gas.

In rupture of the intestines, the dullness and swelling do not supervene until later, when peritonitis is marked, hence marked collapse with extreme pallor, feeble and disappearing pulse, accompanied by dullness, gradually rising in the lower part of the abdomen, indicates hemorrhage, and calls for immediate operation.

Treatment of Internal Injuries of the Abdomen, Including Hemorrhage

In all cases of apparent serious internal injuries of the abdomen, all surgeons agree that it is not always possible to make a correct diagnosis before opening the abdomen, and delay in resorting to surgical relief many times robs the patient of the only possible chance of recovery. and a moderate degree of shock is not a contraindication for an exploratory incision.

The surgeon must be prepared for any and all sorts of surprises, and must have the instruments and material at hand to make quickly any desirable repair. The usual incision is made in the median line with the umbilicus as the center of the opening. The author prefers, unless there are some special indications to the contrary, to make the incision directly over the seat of injury, for the reason that in the vast majority of instances the effects of the trauma lie directly beneath the place of the receipt of the injury. If the abdomen is found full of blood, the blood and clots

should be turned out with a gauze sponge or the hand. While an assistant is flushing the cavity with a warm, normal salt solution, the surgeon rapidly seeks and grasps the place or point of hemorrhage *en masse* with the fingers, and, if possible, draws this into view. If the abdominal incision is sufficiently large, the edges of the wound may be held up and the cavity thoroughly flushed until cleansed of all blood and extravasation. The normal salt solution is most commonly used at a temperature of 105°.

After the flushing, the exposed intestines are covered with large pieces of gauze or pads wrung out of hot normal salt solution. The hemorrhage is usually from a vessel in the omentum or mesentery, and the bleeding point must now be sought for and the artery or vein secured by ligature. Any tear or injury through the mesentery or omentum must be repaired, and if no other injury is found, the abdomen should again be filled up with the hot saline solution, the peritoneum closed, and the abdomen adjusted in layers.

Treatment of Injured Bowel

It is necessary in nearly all cases where the bowel is ruptured to remove the contused edges of the rent, in order to give a clean cut surface for union. Rents of small size may be closed with a Lambert suture, but if the rent is very large, or if it is found in the smaller intestines, of sufficient magnitude to cause a narrowing of the lumen, an end-to-end anastomosis is much better, and safer. There is no question but that end-to-end anastomosis can be done much more rapidly by means of the Murphy button than by any other method, and, therefore, we still employ it in cases in which the patient is practically *in extremis*. The advantages of the button in desperate cases are very great, and it is always possible to perform a second operation at a later date should symptoms arise indicating narrowing of the lumen of the bowel.

A point of great practical importance in using these buttons is to see that the two segments of the bowel are not rotated upon their long axes with regard to each other. That is to say, the mesenteric attachment on one side must correspond to that on the other. This accident has happened more than once in the hurry

of bringing the two halves of the button together, and when once the two halves have been interlocked, they can not be removed without exciting the portion of the intestines in which they lie.

The essential features to successful intestinal resection is "quick in and quick out." As an improvement in the technic of using

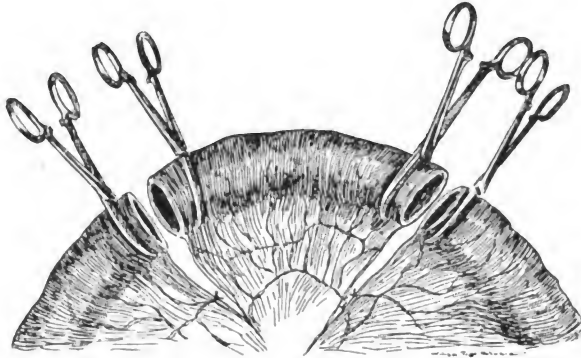


Fig. 60.—Gut resected. (Wallace.)

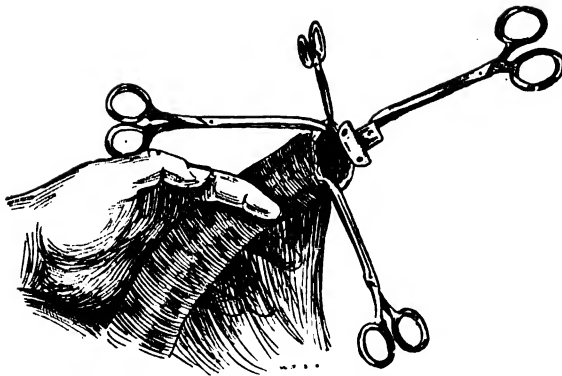


Fig. 61.—Murphy button dropped into end of gut. (Wallace.)

the Murphy button, Dr. William L. Wallace, Syracuse, N. Y., in the *American Journal of Surgery*, February, 1911, advised the following plan:

"The usual method of closing the end of the gut by tying and then inverting with another suture, takes considerable time and is not always satisfactory. The gut is more or less swollen and

edematous, and is very tender and vascular. It does not turn in rapidly and is apt to bleed and pull out. A poorly turned in end sometimes compels a higher resection. A large part of the time of operating is consumed in turning these ends in."

TECHNIC OF OPERATION

The gut is delivered and held up with both hands so that the blood supply in the mesentery can be seen. An electric light globe covered with sterile gauze may be held behind to make the vessels plain. The vessel at the apex of a "V" (Fig. 60) of the mesentery which supplies the gut below and well above the

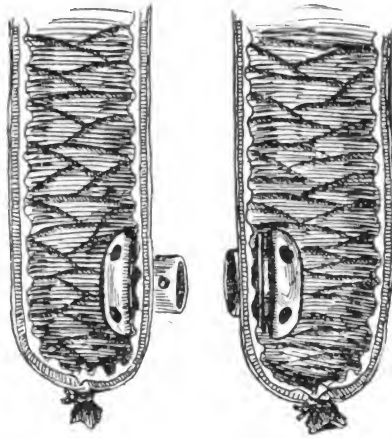


Fig. 62.—Lateral anastomosis with Murphy button. (Wallace.)

strangulated bowel is tied off. Care must be taken not to tie off the blood supply beyond the proposed resection. The clamps being in place, the gut is divided between. Half of a Murphy button is dropped into each open end of the gut, the ends of the bowel are tied off, a fine silk or linen ligature is tied tightly around the end of the gut as the clamp is loosened (Fig. 61), any surplus end is cut off, and the mucus surface is touched with pure carbolic acid.

The halves of the Murphy button are then joined.

In lateral anastomosis (Fig. 62), the results are equally good whether the bowel is left straight or folded. * * * * The cylinder of each half of the button is pushed against the side of

the gut at such a distance from the closed end that it will neither crowd the end nor leave a pocket beyond the button.

The gut over the end of the button cylinder is cut and the cylinder passed through; the two halves are now pushed snugly together. In pushing the halves together, care must be taken not to cut the gut by pushing too hard with the finger on a cylinder which may be long enough to protrude through the button.

The "V" in the mesentery is then closed. The raw edges tied off, and ends of the bowel are brought together by a running cat-gut stitch, which closes the "V" in the mesentery.

If the caliber of the two portions of the bowels that are to be anastomosed differs considerably in size, lateral anastomosis must ever be the operation of choice.

After the clamps have been removed, the area of the operation cleaned up, and the united loop of intestine dropped back into the abdomen, the hot saline solution is again introduced and allowed to remain, and the abdominal incision is sutured.

The question of drainage in these cases is precisely on a par with that of rupture of the stomach. Should there be any reason to doubt the vitality of the line of union, a small gauze drain may be introduced down to the portion of intestines operated upon, in order that should the anastomosis give way, a fecal fistula will result instead of extravasation into the abdominal cavity. This is really the only circumstance under which drainage should be employed, as any attempt to drain the whole abdominal cavity when the irrigation of the abdomen has not sufficed, is futile.

GUNSHOT AND STAB WOUNDS OF THE LUNGS

The vast majority of gunshot wounds of the chest are made by revolver bullets; these bullets, often misshapen by their impact with the ribs or sternum, literally tear their way through the lung, destroying a large amount of tissue, and frequently causing severe hemorrhage. These injuries are most often seen among the lower class, where the clothing is filthy and skin anything but sterile, which aids the ordinary greasy bullet to carry infection into the pleural cavity.

Diagnosis—Injuries of the Lungs

The diagnosis of a penetrating wound of the thoracic cavity is generally easy, although in certain instances it may be exceedingly difficult. When the lung is injured, there will be cough, and in the majority of instances bloody, frothy expectoration, with localized pain on respiration, and the development, later, of pneumonia and emphysema. Should air enter the pleural cavity,



Fig. 63.—Gunshot wound of chest and arm. Wounds sutured eighteen days after admission. Union by first intention; perfect recovery. (Courtesy Professor DePage, Hospital Ocean, LaPanne, Belgium.)

there may be more or less dyspnea, rapid respiration, and hyperresonance upon percussion; therefore, frothy, bloody expectoration is a distinct evidence of penetration of the lung. It must be remembered also that if bleeding has occurred, it usually is troublesome. There also will be dullness on percussion over the most dependent part of the chest, besides absence of fremitus and respiratory sounds.

Treatment

Every case must be considered on its own merits. If the hemorrhage is not severe, and the lung cavity not sufficiently distended to impede the heart action, and the patient after several



Fig. 64.—Illustrates a half spica retentive bandage for breast dressing following injuries of the chest or liver.

hours' observation is not losing ground, operative interference is contraindicated; but, should the general symptoms of hemorrhage, with difficulty of breathing and signs of increasing hemo-

thorax, with displacement of the heart and interference with its action, be plainly manifest, surgical relief is imperative. Very frequently relief may be temporarily obtained by aspiration, a sufficient amount of blood being withdrawn to relieve the pressure on the heart.

Should this method fail, and the presence of a fluid within the thorax on the collapsed lung fail to control the hemorrhage, a more radical operation is called for. Prior to this, all effort to sustain the strength of the patient must be carried out. Warm external applications, rectal enemas of hot saline solutions, and hypodermoclysis should be administered. After a preliminary hypodermic of morphine, with atropine, chloroform should be administered, the rib adjacent to the bullet wound should be rapidly resected, and the pleura widely opened. The punctured lobe of the lung should then be grasped and delivered through the incision, the hemorrhage being controlled by pressure with the fingers of the assistant on the root or base of the lung. The blood clots must be removed from the pleural cavity, and as rapidly as possible, search made for the bleeding points, which will be from the entrance or egress of the bullet wound.

This being found, two deep mattress sutures of heavy catgut should be passed through and through, or around each opening, and by tying these the hemorrhage is entirely stopped. The pleural cavity should be flushed or cleaned with hot normal saline solution and the wound closed without draining. The wound must be closed in layers, hermetically sealing the pleural cavity to prevent pneumothorax and subsequent infection.

In stab wounds the same method of procedure is employed to search for and control the hemorrhage. The bleeding from stab wounds is usually more profuse, and early surgical interference more desirable.

GUNSHOT AND STAB WOUNDS OF THE LIVER

Bullet or stab wounds of the liver are not uncommon, the seriousness of a case varying with the location of the wound and injuries to the large blood vessels.

“Should the knife or bullet enter below the costal margin of the rib and be directed to the right, or should a bullet wound or

knife thrust be inflicted anywhere anteriorly between the 6th and 10th ribs, it will penetrate the liver; but should the wound be inflicted anywhere between the 6th and 10th spaces posteriorly, it would penetrate four layers of the pleural edge of the lung and the diaphragm, before entering the liver." (Bryant and Buck.)



Fig. 65.—Stab wound exposing a portion of the liver.

In case of a stab or bullet wound complicated by compound fracture of the rib, the condition of the liver must always be carefully considered. The injuries are always regarded as serious, the chief danger being hemorrhage and extravasation of the blood, and bile into the peritoneal cavity. It should be remembered that "there is a well-defined peritoneal fold, or 'shut-off' from the

peritoneal cavity, between the liver and the transverse colon, which lies directly in contact with the abdominal wall; and extravasation of blood or fluid may be limited to this area without affecting the general peritoneal cavity." (Cheyne.) The majority of stab wounds are inflicted in the lower border of the liver, and if the wound be of any length, hernia of the liver or bowel may result.

NONPENETRATING WOUNDS OF THE LIVER

Blows, runover accidents, kick of a horse, etc., may cause laceration of the liver tissue with ecchymosis, but if the capsule of the liver is not torn, there will be no extravasation of blood or bile into the peritoneal cavity, such injuries, however, being sometimes followed later by abscess.

Symptoms of Injuries to the Liver

Shock, severe pain, and tenderness over the hepatic area are usually the most marked symptoms. Percussion discloses the fact as to whether or not there is much extravasation or hemorrhage. Rest in bed, morphine to quiet the severe pain, and cold applications, constitute the proper treatment. Should rupture of the liver occur, and the patient survive the immediate effects, the pain and evidence of hemorrhage and shock are always more severe and pronounced; there is also vomiting, the local signs, increased dullness, abdominal rigidity, distention, and other evidences of serious injury, with impending peritonitis.

Treatment.—In nearly all cases, when there is an increase of dullness on percussion, an exploratory incision should be made to the left of the median line, which will expose the lower and central part of the liver. The hemorrhage should be located, and controlled by suture, or tampons of gauze. All clots removed, the cuts in the liver are best closed by deep through and through mattress sutures, and if this does not prevent oozing, the hemorrhage must be controlled by packing every recess of the wound with subiodide of bismuth gauze, and the end of the packing brought out through the abdominal wound for the purpose of draining. The abdominal cavity and colon should also be pro-

tected by strips of gutta-percha tissue. A number of silkworm sutures may be inserted through the skin, but not tied until later, as the wound should be left open for drainage. A large pad dressing is then applied externally and held in place by a suitable bandage.

Injuries of the Pancreas and Spleen

“Injuries to the pancreas by blunt force have occurred more frequently than formerly was supposed possible. Their causes are numerous; a blow or a kick against the upper part of the abdomen, a contusion by falling against the edge of a table (Mayo-Robson), burying under masses of earth, crushing between two cars, and accidents with vehicles. Cowen describes a peculiar accident where a man struck upon the water with his abdomen and thus injured his pancreas. Very often the force of the striking object has not been very great; on other occasions, this force has been so severe that it seems miraculous that other organs escape injury.”*

There are no pathognomonic features of injuries of the pancreas or spleen that would enable the surgeon to arrive at a positive diagnosis. In the majority of cases the diagnosis has been intraabdominal hemorrhage or wounding of the stomach or intestines. We know that contusions of the abdomen without any injury of the internal organs can give the same clinical picture as a rupture of a hollow viscus or an internal hemorrhage. It is, therefore, incumbent to exclude the possibility of dangerous injury by means of an early exploratory laparotomy. He who waits for clinical symptoms; i. e., unmistakable signs of general peritonitis, will be too late in a good many cases.

The treatment, therefore, is speedy operation. Carle, of Munich, was the first to save a patient by laparotomy. In his case the gland was completely torn across. He, therefore, sutured the covered ends by careful silk sutures—three posteriorly, three to four anteriorly—only taking in the fibrous capsule. This author also calls attention to the possibility of a subsequent gangrene of the severed piece of the pancreas and considers the necessity of extirpation. The pancreas is supplied with blood by the superior

*Fischer, Hermann: *Am. Jour. Surg.*, 1912, xxvi, No. 7.

and inferior pancreaticoduodenal arteries, and the pancreatic branches of the splenic artery. As long as the splenic artery has not been torn, the blood supply of the tail of the gland is not seriously interfered with. If, however, the splenic artery has been injured, it must be tied, and the separated piece of the gland had better be excised. In cases in which the pancreas or spleen is crushed and bruised, the simplest and best method is the careful adjustment of a tampon around the wounded part, in order to establish free exit for the pancreatic or splenic secretions. Where gauze is employed for drainage it should be wrapped with rubber tissue to facilitate its removal.

ICTERUS, OR JAUNDICE

By the term jaundice is meant a discoloration of the skin and tissues of the body, due to the retention of bile pigment. This discoloration of the skin varies from a light yellow to a very dark greenish brown. There is always more or less intense itching of the skin, and in protracted cases the urine is coffee-colored or almost black. The discoloration of the urine usually appears before the sclera of the eye or skin is markedly noticeable. The stools are clay colored, owing to the absence of bile.

Icterus is a symptom common to various diseases of the liver and bile ducts, and it is often a matter of great importance to recognize and dissociate the lesions which are of medical significance only. Obstructive jaundice is distinctively surgical. This form of jaundice results usually from obstruction of the common duct of the liver by an impacted calculus. Nausea and vomiting, with a history of paroxysmal pain, soon followed by chills, fever, and sweats, with enlargement of the liver and spleen are the characteristic and unmistakable symptoms. If the obstruction is not relieved, suppurative cholangitis, with ulceration or perforation of the duct, may ensue and cause a fatal peritonitis. Surgical intervention is always indicated when the jaundice is persistent and the symptoms tend to endanger the vitality of the patient.

Prolonged icterus interferes materially with the coagulability of the blood. This has been clearly determined. The impover-

ished condition of the blood is due, generally speaking, to the continued presence of the bile pigments and diminution of the amount of hemoglobin. Therefore, before proceeding to operative measures, when the jaundice has continued for some time, the surgeon should carefully test the coagulability of the blood. This can readily be determined by tapping a small vein and placing a few drops of the blood in a test tube and noting the time required to form a clot. Should the time exceed five to seven minutes, preliminary treatment will be necessary. For this purpose the author prefers a combination of the various remedies; viz., 40 grain doses of calcium chloride, given by mouth, largely diluted with water, every four or five hours for two or three days, followed by the hypodermic injection of horse serum or 20 c.c. 1:1000 antitoxin once or twice daily, and the morning of operation 20 c.c. of coagulose will tend at least to lessen the danger of capillary hemorrhage. It must not be forgotten that hemorrhage from oozing is often delayed, or may not appear for two or three days following the incision, and may then be so profuse as to gradually exsanguinate the patient.

The operation of emergency consists, therefore, in the effort to accomplish external drainage of the gall bladder. The incision should be made in the usual nipple-umbilical line. The gall bladder being exposed, is seized and held well up in the wound. A digital examination should now be made to determine the location and character of the obstruction, and if possible, the impacted stone should be gently milked or worked back into the gall bladder and removed. If, however, the obstruction is well below the opening of the cystic duct, no great attempt should be made to remove it, at this time, the best and safest plan being to drain the gall bladder and thus remove the bile pigment from the system. The gall bladder should be carefully surrounded or walled off with strips of subiodide of bismuth gauze with rubber tissue. The gall bladder is then opened, a half inch drainage tube of rubber inserted, and held in place by a purse string suture of No. 2 chromicized gut, the drainage tube is then pushed into the sac sufficiently to invert the cut edge of the gall bladder, and a second purse string chromic gut suture is inserted by way of reinforcement, to prevent leakage.

In order to control the capillary oozing when serious hemorrhage occurs, Mayo recommends as the most effective treatment, carefully packing the wound with iodoform gauze in which is incorporated a considerable quantity (in dry powdered form) seven parts boric acid with one of acetanilide. In the absence of hemorrhage, the drainage of the gall bladder very rapidly eliminates all the bile pigments from the blood, and the skin and urine soon become normal in color. After five to seven days, secondary operative measures, if necessary for the permanent relief of the obstruction, may be considered.

PENETRATING WOUNDS OF THE ABDOMEN

Stab and Gunshot Wounds

Cuts and stab wounds of the abdomen are quite common. In this class of cases, as well as in gunshot injuries, it is of the utmost importance to ascertain without delay, whether or not the internal viscera or organs are injured. The wound should be at once opened up and the contents of the abdomen carefully examined. The treatment of cuts and wounds of the intestines are fully described under internal lacerations or contusions. Therefore, only ventral hernia or protrusion of the bowel through the wound will be taken up here. If the stab wound is large, extensive protrusion may occur, and a large mass of intestines may be found projecting through the skin wound, and again, very frequently, the opening through the skin being small, and the patient fat, the bowel may collapse through the rent in the peritoneum and remain lodged in the subcutaneous tissues, giving rise to the so-called interstitial hernia. The omentum, intestines, or even the stomach may protrude in this manner. There is always risk of strangulation, whether the protrusion is external or internal, and this danger is increased when the bowel collapses with the omentum. The possibility of an interstitial hernia is another good reason for opening the abdomen without delay, for it is a matter of the gravest importance to see that no protrusion has taken place into the subperitoneal tissues, and unless the wound is opened, such an occurrence may escape notice until too late.

TREATMENT

If called to a case of stab wound of the abdomen when there is a protruding mass or knuckle of intestine, the mass should be covered with a piece of moist sterile gauze, gently isolated or elevated, while the abdominal wall is wiped dry and painted with a 5 per cent tincture of iodine, after which the whole mass and abdomen is irrigated with hot normal salt solution (105° F.), and the mass flushed with sufficient force to carry away all particles of foreign substance, clots, etc. A grooved director or the finger is inserted into the upper and lower angle of the wound and the entire thickness of the abdominal wall is incised sufficiently to admit of complete inspection and freeing of the entire mass.

Surrounded with a hot moist pack, the mass should now be separated and examined. The omentum should be spread out, and if much soiled or bruised, it will probably be safest to ligate and remove it. If there is no cut or wound of the escaped bowels, after again thoroughly cleaning with normal salt solution, the patient should be placed in Trendelenburg's position, and the bowel and protruding mass allowed to drop back into their normal positions. The peritoneum is carefully closed with a continuous catgut suture No. 2 or 3, and the muscles and skin closed in the usual manner. As a precaution, two or three reinforcing sutures of silkworm-gut should be inserted, including the deeper fascia, muscles, and skin, and at the lower angle of the wound a small roll of gutta-percha tissues or gauze drainage is inserted, to be removed in 24 hours. The abdominal wound is drained in the usual manner, and the patient treated as after an ordinary laparotomy.

In delayed or neglected cases, or when there is evidence of marked strangulation and injury to the gut or intestines, with every evidence of a foul or contaminated wound, if the patient's condition warrants it, resection may be advisable. Or, if the patient's condition is grave, an artificial anus may be made by clipping away the strangulated mass and stitching both ends of the severed gut to the abdominal wall, leaving the question of anastomosis until the patient's condition has improved sufficiently to warrant its closure at a later date.

Gunshot Wounds of the Abdomen

According to Keen and other able surgeons, gunshot wounds of the abdomen are more serious, and mortality is greater in civil life than in war. Gunshot wounds are more likely to involve the intestines and be multiple, than are stab wounds. Further, the size of the wound does not denote the caliber of the bullet, and lastly, wounds in the upper abdomen, whether stab or gunshot wounds, are less to be feared than in the lower abdomen.

TREATMENT

Immediate operation is always indicated, and if done under aseptic conditions, is relatively safe, since fatal results are due to hemorrhage or septic peritonitis. Both are avoidable by early surgical intervention.

As a summary of treatment, Keen, in his work on "Surgery," vol. iii, p. 743, says: "Repair of the gastric or intestinal wounds by suture or excision is called for in all forms or characters of wounds. Gastroenterostomy is rarely necessary. Wounds of the solid internal organs may be sutured or packed. Wounds of the bladder may require either suture, partial excision, or perineal drainage. Ureteral wounds may require transplantation of the ureter or nephrectomy, and lastly, drainage of an abdomen after a gunshot wound is safer, and frequently eliminates infection.

Impaling wounds of the abdomen are the result of a fall upon the end of a stake, picket, or tine of a hay fork, or may possibly result from the horns of cattle. The abdomen may be punctured at any point, and if the abdominal cavity is entered, an exploratory incision is imperative to ascertain the extent and nature of injury, if any, to the viscera.

Gunshot and Stab Wounds of the Kidneys

Laceration of the kidneys may result from being run over by a heavy wagon, from a blow, fall, kick of a horse, or from the toe of a boot. It seldom occurs without visible injury to the other viscera, and may, therefore, be classed more as a complication. The immediate result of a lacerated wound of the kidney is to increase shock and hemorrhage, to which is later added the com-

plication of extravasation of urine. A number of gunshot or bullet wounds of the kidney have been reported in private life. The effect of extravasated urine in the peritoneal cavity is not always immediate. The peritoneum and tissues are now known to possess a well-marked degree of tolerance to fresh urine, and infection does not occur until the urine becomes more or less decomposed.

SYMPTOMS

Shock is always present, but hematuria may be delayed for several hours or days. Local pain and tenderness, muscular rigidity, and a slowly developing tumor in the lumbar region is an indication of injury to the kidney, the blood and urine being retained within the fatty capsule. Later, hematuria and extravasation of urine are the distinct characteristics of injuries of the kidneys. In open stab or gunshot wounds of the kidneys, the skin wound may be small and clean cut, and the signs that indicate injuries to the kidney are manifested by hematuria and the escape of urine from the wound.

TREATMENT

In an injury to the kidney, occurring as a result of abdominal trauma—without an open wound—it is very often a matter of great difficulty to determine the extent of the injury. Hence, "Rest in bed with cold applications locally, and the hypodermic administration of morphine, with the treatment of symptoms as they arise, are commendable measures." (Bryant and Buck.)

In gunshot or stab wounds of the kidneys, the main indication for treatment is to control the hemorrhage and procure thorough drainage. A transperitoneal incision is nearly always indicated, but where an abdominal exploratory incision has already been made, the kidney can be explored and examined. In the absence of this, the posterior incision is always to be preferred, when the kidney alone is involved, in order to secure proper drainage and avoid entering the peritoneal cavity. Through the usual oblique incision, the kidney may readily be explored. If the substance of the kidney is found lacerated, it may be treated by suture or tampon, as the kidney is susceptible of remarkable repair. Partial ex-

cision is often practical, but complete nephrectomy is required where the renal artery is involved. Drainage through the loins is frequently all that is necessary in slightly lacerated wounds.

Similar wounds may involve the perineum and the scrotum, and the contents of the scrotum may be severely mutilated. Open treatment, with gauze drainage, is often essential to recovery.

PENETRATING WOUNDS OF THE STOMACH

Stab or pistol shot wounds of the stomach are usually recognized by the position, depth, and direction of the wound, escape of food or fluid, vomiting of food, etc. There is always more or less shock, with the characteristic pallor, cold extremities, rapid, feeble pulse, shortness of breath, ringing of the ears, etc.

Treatment

In civil practice pistol shot wounds are usually of smaller caliber than those inflicted during warfare, and while it is true that it is possible for these bullets to penetrate the stomach or pass completely through it, and recovery takes place without serious symptoms or after effects; nevertheless, as Makin truly says, "In civil practice it is safer and better surgery to make an exploratory incision, which is the only means of determining the extent and character of the injury," to which the author would add, "and offers the only method of preventing septic infection."

Stab wounds of the stomach are ordinarily mere punctures, and are usually found on the anterior surface, but, unfortunately, stab wounds are more liable to cause serious hemorrhage than pistol shot wounds, especially if the excision is near the pylorus, and, therefore, the hemorrhage or extravasation and infiltration of the tissues may be so extensive as to call for immediate surgical relief.

Technic.—The transverse or median incision is usually made. On exposure of the stomach, immediate search should be made for the wound, and when found, it should be closed temporarily by means of a double tenaculum or other suitable forceps. All extravasations, blood clots, or contents of the stomach should be

carefully sponged away, and before proceeding further, the surgeon should endeavor to protect the remaining portion of the peritoneal cavity with sterile gauze pads. The contents of the stomach should be carefully removed by gastric lavage, repeatedly flushing the stomach until the water returns clear. The stomach should also be drawn well into the wound. The incision or wound in the stomach may then be closed by a continuous catgut suture, which is reinforced by a row of interrupted Lembert sutures of silk. If the edges of the wound can be brought together in good apposition, nothing further need be done. But if the wound can not be closed satisfactorily, it is better to fasten a portion of the omentum over the line of suture.

Where there has been any extravasation of the contents of the stomach, before closing the abdomen a careful toilet should again be made and a gutta-percha or small gauze drain should be inserted at the lower angle of the incision. Finally, the abdominal incision should be closed in layers with interrupted catgut sutures and the skin closed with metal clips.

PUNCTURE WOUNDS OF THE BLADDER

Puncture wounds are rare, since the bladder is located behind the bony pelvis. Penetrating wounds are not, however, uncommon, and hemorrhage is often the important factor. Rupture of the bladder may also result from a blow, kick, or fall while the bladder is distended. It is often a matter of great difficulty to determine whether or not the bladder is ruptured, where there is no external wound; again, as to whether or not the injury is extra- or intraperitoneal. Hence, the former "expectant" plan of treatment is now considered obsolete and unpardonable. The presence of severe pain, pronounced shock, history of an injury in the region of the bladder, with futile effort at passing water, and especially when little or no urine, or bloody urine is found on inserting the catheter, are symptoms which point distinctively to rupture of the bladder; and unless prompt surgical action is taken, the prognosis is exceedingly grave. The safest plan, therefore, in either penetrating wounds or supposed rupture of the bladder, is to make an immediate exploratory incision.

In penetrating wounds through the perineum, the incision should be made in the line of injury, or the same as for perineal lithotomy, through which the bladder can be examined and free drainage established. A low median abdominal incision permits observation of the abdominal contents as to blood and extravasated urine, and also permits a direct inspection of the bladder. In suprapubic incisions, in addition to the ordinary drainage, a soft rubber self-retaining catheter should be introduced through the urethra and allowed to remain for several days to secure more thorough drainage. In all cases of doubt in this class of injuries, an exploratory incision is the safest procedure.

STAB WOUNDS OF THE NECK

Cut Throat

Stab or incised wounds of the neck are not so common as scalp or face wounds. The injury known as "cut throat" is nearly always self-inflicted, and the seriousness of this class of wounds depends entirely upon the position and depth of the incision. The great thickness of the muscles of the neck, more prominent in extension or elevation of the head during the act, tend to guard the great vessels, hence, unless one of the carotids is incised, the individual rarely succumbs from hemorrhage before surgical assistance can be obtained. The suicide, as a rule, selects what is known as the high incision; that is, just above the prominence of the thyroid cartilage, or directly across the throat, at about the median line, cutting through or just below *pomum adami* and exposing or cutting through the trachea. The vessels ordinarily injured in such attempts at self-destruction are the superior thyroid and facial arteries. The hemorrhage from the vein, however large, usually stops spontaneously or by slight pressure. Stab or cut wounds of either carotid usually cause death from hemorrhage before the arrival of a surgeon.

TREATMENT

Superficial wounds of the neck may be closed by adhesive plasters, and receive the same treatment as ordinary wounds. "Hem-

orrhage from deep vessels must be first of all controlled by pressure with the finger over a sterile piece of gauze. This compres-



Fig. 66.—Fatal stab wound of the neck.



Fig. 67.—Temporary method of controlling hemorrhage from veins in the neck.

sion must continue until the surgeon, properly assisted, is in a position to search for the bleeding vessel in a rational manner.

Groping with the artery forceps in the deep wound without visual control is senseless and dangerous.

To enable the surgeon to catch a bleeding vessel in this locality, the wound margins must be held widely apart by means of suitable retractors. If the wound canal is small, an incised wound or one due to a small bullet, then the wound must be enlarged by sharp incision. With open wound margins and sufficient gauze sponges on hand to absorb and wipe away the welling-up blood, the source of bleeding may be recognized, caught in forceps, and ligated. Both central and peripheral ends of the vessels must be so treated. Then the wound is sutured. Only a small piece of gauze wicking is inserted as a drain. Compression dressing is not applicable to the neck, but the head should be immobilized.

If there has been great loss of blood, and, in consequence, very much exhaustion, the patient should receive the usual treatment for shock and hemorrhage.

If the trachea has been severed, a tracheotomy tube should be introduced and gauze packed carefully around it. Hot saline enemas, or hypodermoclysis, should be given early; and as soon as the condition of the patient warrants, efforts should be made to repair the wound. No anesthetic is ordinarily required.

The continuity of the esophagus, trachea or pharynx, if injured, should be restored, and mattress sutures of chromicized gut should be so inserted as to hold together the severed ends of all the divided muscles, especially those attached to the hyoid bone.

The gaping wound should be closed in layers, with small gauze drains inserted as needed. The skin wound may then be closed with metal clips.

Some authors strongly advise an early tracheotomy where the trachea and esophagus have not been severed, to prevent subsequent sepsis or bronchopneumonia. Later, the patient, in order to prevent undue tension of the part, should be kept in a semisitting position for several days, and rectal feeding is necessary for at least forty-eight hours.

In penetrating stab wounds of the neck, should the carotid or jugular vein be divided, immediate digital compression of the part is essential to the preservation of life, and if successful in temporarily controlling the hemorrhage, the tissues should be held

firmly until an incision can be made to grasp and ligate the bleeding vessel. The incision in such a case should be made at the most available point, regardless of the primary wound, for the artery can not be ligated through a small incision.

WOUNDS OF THE RECTUM AND ANUS

Wounds of the rectum and anus occur as a result of falls or sitting forcibly upon some hard, sharp substance—shoe scraper, picket fence, pitchfork, accidental breaking of a chamber pot, and direct blows from kicks, etc. Such cases are common to physicians who have extensive country practice.

In all of this class of injuries a careful examination of the rectal walls should be made, since peritoneal infection and pelvic cellulitis are very common after rectal tears, even though penetrating wounds do not reach the peritoneal membrane.

Symptoms and Treatment

Shock, accompanied by nausea and vomiting, is of frequent occurrence; pain is often intense, and more or less nervous excitability is present. All fecal matter should be removed by enema, the sphincter dilated, and rectum carefully inspected. Any tears or injury should be carefully disinfected with tincture iodine, and a Senn rectal tube wrapped with iodoform gauze inserted and held in place by a T-bandage.

In penetrating wounds of the anterior wall of the rectum, where by the presence of abdominal pain, rapid pulse, rise in temperature, vesicle irritation, traumatosis, the surgeon has reason to fear pelvic infiltration or peritonitis, a suprapubic extraperitoneal abdominal incision should be made, the pelvis carefully inspected, and provision for ample drainage carried out, after a careful toilet of the pelvic cavity.

BRUISES AND SPRAINS

Bruises

Bruises accompanied by abrasions of the skin, ecchymosis, with more or less pain and soreness, should be carefully cleansed and

disinfected, and treated by rest and applications of equal parts of tincture of camphor, tincture arnica, and distilled extract of witch-hazel; reduced one-half with hot water. This is not only soothing, but increases the tendency to absorption and hastens recovery.

In all sprains of the joints, especially the ankle and knee joints, a splint should be applied to prevent motion, and secure rest of



Fig. 68.—Proper position for foot in applying Gibney dressing. Dressing will be tight when support of knee is removed.



Fig. 69.—Gibney ZO dressing complete.

the parts; after which the above named application applied as hot as can be borne will also prove beneficial. The popular method of fixation of the ankle joint by adhesive strips is also a most excellent procedure, if applied before much swelling occurs.

Sprains

By the term *sprain* is meant an injury to the joints, tendons, or tissues surrounding the joint, without the existence of a frac-

ture or dislocation. The joints most commonly involved are the ankle and the wrist. Those of the ankle, especially, are accompanied by severe pain. More or less swelling is found, or contusion and ecchymosis may be extensive, causing the tissues to assume a black and blue appearance. Pain and tenderness on motion of the joint is always present, which materially interferes with the use of the limb.

Injuries of the hip in elderly people, resulting from a fall or being forcibly seated upon the buttocks, may be followed by symptoms closely simulating acute neuritis, fracture or even dislocation of the hip. Pain more or less intense usually develops within twenty-four hours. There is no shortening or other positive evidence of fracture, eversion of the foot, etc., but there is a slight elevation of temperature and rapid pulse with an increase of general excitability. After a few days these symptoms gradually disappear, and the patient recovers without motor or trophic disturbance.

Sprains of the ankle joint, if severe, owing to relaxation of the muscles or stretching of the tendons, are liable to frequent recurrence. Hence, the early use of the joint should be condemned, and after recovery from the injury, an elastic ankle brace should be worn for several weeks.

DIAGNOSIS

In all but the simplest forms of ankle and hip sprains, a radiogram should be taken, which is the only safe method of determining whether or not a fracture is present, which is so frequently overlooked in this class of injuries.

TREATMENT

As soon as possible, the joint must be placed at rest by means of a properly adjusted splint, and bandaged. Sprains of the shoulder joint are sometimes very troublesome, especially in elderly people, in whom pain and loss of motion may increase, and the joint become stiff and arm almost useless, the deltoid muscle being most commonly involved. The arm should be placed in a sling, supporting the arm and preventing dragging upon the

muscles of the shoulder. Applications two or three times a day of a liniment composed of equal parts of spirits of camphor, tincture of arnica, and distilled extract of witch-hazel will prove of benefit, and later, massage and the employment of an electric vibrator may be resorted to.

Some sprains of the knee joint, where injury to the tendons is most liable to occur, are best treated by the application of a plaster cast, and the joint should be kept at rest for three or four weeks.

Sprains of the ankle joint are best treated by means of an anterior splint and lightly applied gauze or elastic bandage, which may readily be removed, and admits of the application of soothing lotions and massage, which should be commenced early. Or, the ankle may be supported by means of adhesive plaster strips, as popularized by Gibney, and described by Stimson (Stimson "On Dislocations and Fractures") as follows:

"The first strap starts at the outer border of the foot, near the little toe, and passes horizontally around the back of the heel, ending on the inner side of the foot about its middle. The second strap is applied vertically and passes from the lower part of the calf of the leg down alongside the tendo Achillis, under the heel, and terminates above and behind the malleolus. The third and fourth straps are similarly applied, a little above and overlapping by about one-half the first and second straps respectively until the whole ankle is covered in. Additional straps may be applied over the malleoli and the tendo Achillis."

CHAPTER V

SURGICAL EMERGENCIES (CONT'D.)

ACUTE APPENDICITIS

That acute appendicitis should be classed amongst "surgical emergencies" is now conceded by all surgeons. In the more pronounced type of cases, delay of even a few hours in operating very frequently robs the patient of his only hope of recovery. Symptoms demanding immediate operation are where the attack develops suddenly, and while the symptoms may closely resemble the ordinary type, yet they are more pronounced or intense. There is always very severe, acute abdominal pain, at first referred to the umbilical region, but later becoming localized over the lower end of the cecum, and the pain often extends down into the right thigh, with nausea and vomiting, thirst, rapid pulse, and facial expression indicative of serious trouble.

If the appendix has ruptured, the temperature will be subnormal, and to the other symptoms there will be added more or less shock and restlessness. In many cases the first symptoms are those of perforative peritonitis, very severe pain over the position of the appendix, with constant vomiting, and this most dangerous type is not infrequently overlooked.

Differential Diagnosis

Appendicitis may be distinguished from typhlitis by the history of the cases, chronic constipation, indigestion, and the formation over the cecum of a tumor. Intestinal colic may be recognized by absence of local rigidity, character of the pain, with vomiting, diarrhea, and other intestinal disturbances.

In intestinal obstruction, if there is local pain, it is referred to the umbilical region, and for the first twenty-four or forty-eight hours there is seldom any rise in temperature. Volvulus pains are always referred to the left iliac region, and in children intussusception is more common, with bloody stools and the

characteristic tenesmus, and the tumor may be felt through the rectum.

In the diseases of the female, adnexia, acute salpingitis, tubal rupture, or, in abdominal crises due to Meckel's diverticulum, a differential diagnosis is often impossible before opening the abdomen.

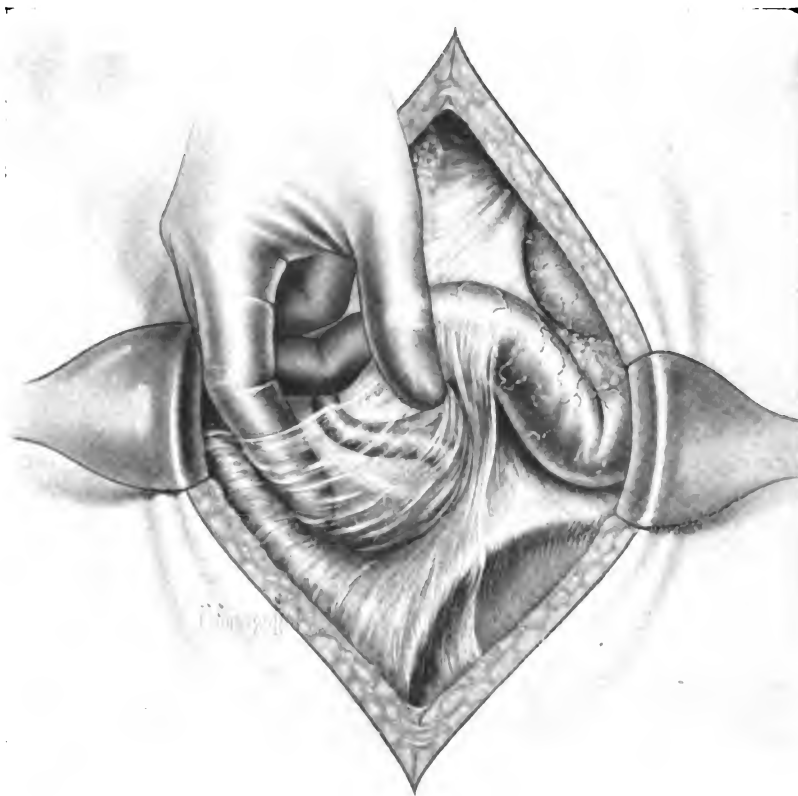


Fig. 70.—Appendicitis complicated by adhesions.

Treatment

In mild cases, the Ochsner plan of treatment is to be preferred: "Gastric lavage and total abstention from food and liquids by the mouth, cold, local applications to relieve pain and prevent suppuration." The stomach should be kept empty for twenty-

four to thirty-six hours, during which rectal feeding is necessary. If improvement does not follow, operation is advisable. In acute and pronounced attacks of appendicitis, immediate operation offers, in many instances, the only possible hope of recovery; and if the operation can be performed within the first six to ten hours, the mortality is greatly lessened.



Fig. 71.—Diseased appendix showing needle found therein. *A*, Proximal opening. *B*, Needle found protruding at *D*. *C*, Enterolith. (Dr. George Boody.)

TECHNIC OF APPENDECTOMY

In females, and in all obscure or complicated cases, the incision should be made in the median line, as it renders more accessible to the surgeon all parts of the pelvis. Ordinarily the usual oblique skin incision one and one-half to two inches in length is made directly over the appendix; the fibers of the external oblique, internal oblique, and transversalis muscles are then separated with the handle of the scalpel or forceps blades, down to and exposing the peritoneum. The peritoneum is then lifted

between two mouse-toothed or tissue forceps, and opened with scissiors. Clasping and fixation of the edges of the peritoneum with Peon forceps will save time and confusion in finding the peritoneum later.

Note the position of the cecum and follow the white line of the colon downward to its base; locate the appendix with the finger tip, seize it gently with a pair of forceps and draw it well out of the incision, protecting the wound with sterile gauze. Ligate the mesenteriolum, remove the appendix between two forceps, and ligate the stump with silk, linen, or chromicized suture. After touching the cut end of the appendix or stump with carbolic acid crystal, followed by alcohol, invert and whip over the stump with fine silk or linen. Allow the cecum to drop back into its normal place, pull down the omentum, when possible, and carefully close the edges of the peritoneum with a running suture of catgut, No. 2, carefully approximate the edges of the abdominal muscles, and insert catgut sutures in two layers; close the skin wound with metal clips, and dress with sterile gauze held in place by adhesive strips. To avoid adhesions and wound complications, keep the patient in a recumbent position from six to ten days.

PERITONITIS

From an emergency standpoint peritonitis may be classed as acute localized or acute general septic peritonitis. Peritonitis is always a secondary condition dependent in the majority of cases upon a bacterial invasion from a diseased appendix, a septic infection involving the uterus and its adnexia, or acute obstruction of the bowels. It may follow as a result of external violence with or without intestinal rupture, and not infrequently may develop suddenly during the course of a chronic or prolonged illness such as disease of the pancreas or gall ducts, abscess of the liver, ulceration and perforation of the stomach or duodenum, and, lastly, peritonitis sometimes occurs in the terminal stages of nephritis or scarlatina, and especially pneumonia, in children.

Symptoms

The characteristic symptoms of acute general peritonitis are: intense abdominal pain, spasm and tenderness on pressure over the

abdomen, rapid pulse, intense thirst, nausea and vomiting and marked failure of the vital forces. The symptoms usually develop suddenly. Ordinarily there is a history of constipation and there may have been a preliminary chill. The temperature may be normal or subnormal, but soon rises to 101°-103°. The patient lies continuously upon the back with the knees flexed, and soon becomes restless and anxious. The tongue is dry and coated white, the facial expression always indicates a serious condition. The character and rapidity of the pulse is always a reliable guide; the temperature never is.

Should nature succeed in walling off the diseased focus or site of the primary infection, by adhesions, the inflammation becomes localized or circumscribed, to terminate in abscess. Should this process take place within the pelvis, it is called by surgeons *pelvic peritonitis* or when occurring over the cecum, *perityphlitis*, *pericecal* or *iliac abscess*.

Treatment

Acute septic peritonitis is distinctively surgical. Murphy, Keen, Mayo, Van Buren Knott, and other distinguished surgeons unite in the statement that: "The fate of these patients really lies in the hands of the practitioner who is first called to attend them. Neglect to call in a surgeon is nothing less than deplorable." (Keen.)

To attempt to overcome or control a rapidly spreading peritonitis by the Ochsner method of "cold applications and starvation" (however effective in suitable cases) is likewise criminal.

The one great essential, therefore, in the successful treatment of acute septic peritonitis is early operation. "Prompt, rapid laparotomy, careful administration of the anesthetic, removal, repair, or some method of exclusion of the point of infection, the Fowler position during and some days after operation, as complete rest as possible, drainage and lastly proctoelysis, constitutes the most effective measures now known." (Keen: "Surgery," vol. vi.) To merely open and drain the abdomen without special attention to securing or walling off the source of the infection, however elaborate the "toilet of the peritoneal cavity," is likewise poor surgery.

MEDICAL TREATMENT

In delayed cases, where surgical relief is not advisable and where the shock alone might rob the patient of the only hope of recovery, the following method of treatment is recommended. The patient should be placed at rest in a semi-Fowler position to facilitate respiration and the passage of gas and relief of tension. Hot moist applications, so long as they afford relief, should be constantly applied to the abdomen. Opium in the form of powdered opium or tincture of opium should be given, in sufficient quantity only to control the pain and restlessness of the patient. The large doses recommended by the elder Austin Flint, and for many years considered indispensable to recovery in these cases only to be discarded later as unnecessary, if not absolutely harmful, has once more become popular and many surgeons of note are now employing this remedy, not only for the purpose of affording relief to the patient, but to retard the absorption of the poisonous toxins. Large doses are not given, nor are they often required, and the hypodermic use of morphine does not accomplish the results desired, and should not be given. One-half grain of powdered opium or ten to twenty drops of deodorized tincture of opium, twice daily, is usually sufficient for the purposes stated.

Proctoelysis, as described by Dr. J. B. Murphy, page 94, should be commenced as early as possible. A 5 per cent solution of dextrose may be added to the salt solution if there be urgent need of nourishment. For hiccup or the disagreeable eructations of gas or fluids, gastric lavage affords great relief and the introduction of a well-oiled rectal or colon tube will tend to overcome the meteorism.

In pronounced cases, antistreptococcic serum has, in the author's hands, proved highly beneficial, and Crile and others recommend the employment of an autogenous vaccine made from the exudate of the individual.

TUBAL RUPTURE—ECTOPIC GESTATION

Extrauterine pregnancy may be tubal or interstitial. The clinical symptoms are usually about the same. Rupture of the tube seldom occurs before the second month. There is usually a

history of the stopping of menstruation, morning nausea, and other symptoms of pregnancy, although they may be absent. It is not uncommon to have colicky pains and slight uterine hemorrhage, with a feeling of fullness or distress in the lower abdomen. The main symptoms of tubal rupture are those of pain, hemorrhage, or shock. There is sudden and excruciating pain in the lower abdomen or pelvis, which can usually be located in one or the other iliac regions. Prostration is usually very marked, syncope is not uncommon, and there may be more or less profound



Fig. 72.—Ectopic pregnancy.

collapse. The patient becomes cold and clammy, pulse rapid and feeble, with marked evidence of anemia, even to the point of exsanguination. It is not uncommon in less severe cases for the hemorrhage to cease, the patient rally, and after an interval of a few days or weeks, a recurrence of the same phenomena takes place, to which the patient may succumb if surgical relief is delayed.

Following the rupture of the tube, there is simultaneously a bloody discharge from the uterus, but never in sufficient quantities to account for the sudden anemia. In the vast majority of

cases the abdomen becomes more or less distended, there is marked dullness on percussion in the lower abdomen, and tenderness on touch. Nausea and vomiting are also present. The diagnosis in such cases is usually plain and unmistakable. The absence of menstrual flow for a month or two, the sudden severe pain, with rapid anemia, the presence of a pelvic tumor, or hematocele, usually behind or on one side of the uterus, with the cervix or uterus generally displaced to one side, are sufficiently significant for prompt action.

Treatment

The treatment of tubal rupture is distinctively surgical. The first important question is whether to operate immediately in order to check the hemorrhage, or to defer surgical interference until the patient has rallied from the shock. Rarely is the shock so profound that immediate operation would be unsafe, or increase the risk, and it is very often a difficult matter to differentiate between hemorrhage and shock. However, the pulse must be watched carefully and if there is any marked improvement in volume, the operation may safely be deferred. If, however, the pulse continues to become more feeble, and the abdominal dullness seems to be gradually increasing, the only safe course is to operate as soon as preparation therefor can possibly be arranged.

The incision is usually made in the median line, and when the abdomen is open it is well to recall the fact that the hemorrhage in these cases can come but from two sources. First the ovarian artery, in the fold of the peritoneum forming the suspensory ligament—the artery entering the ovary at its anterior border—or, second, from a branch of the artery in the broad ligament, near the cornu of the uterus, which furnishes the chief blood supply to the tube. The hemorrhage being thus instantly controlled, the abdominal cavity should be thoroughly flushed with a copious supply of saline solution at the temperature of about 105°, until all blood clots and blood have been removed. Then proceed to ligate the artery on both sides of the ruptured tube, and remove the affected tube and the entire placental mass with the customary “V” incision of the broad ligament. The operation is usually a

very simple one, and should be rapidly performed. The abdominal cavity, if the hemorrhage has been severe, is left full of the hot normal salt solution and the wound closed in layers, without drainage. A hot rectal enema of normal salt should be administered before the patient is removed from the operating table. The patient should then be placed in a bed with the foot of the bed slightly elevated and kept warm by artificial heat.

Treatment of Advanced Ectopic Gestation

After the sixth month it seems justifiable to give the life of the child consideration and allow the pregnancy to approach term,

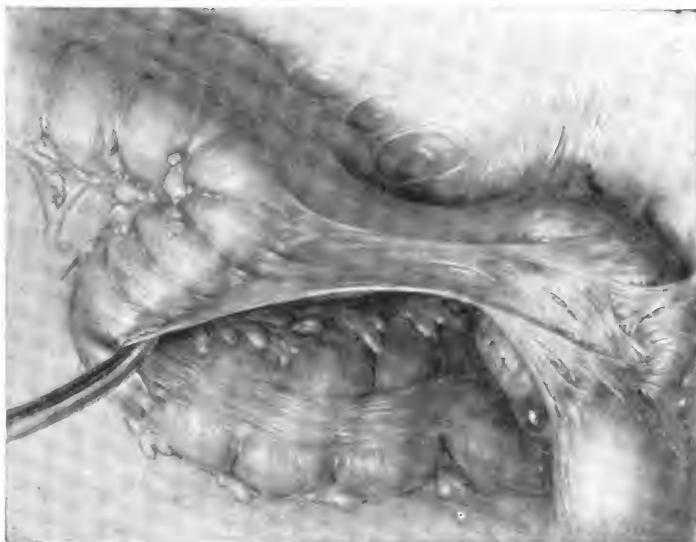


Fig. 73.—Adhesions following ectopic gestation and rupture of tube.

avoiding spurious labor by operating at eight and one-half months by Cesarean section.

The conclusion of the whole matter of technic of the operation for advanced ectopic pregnancy is management of the placenta, remembering that when rupture has occurred between the layers of the broad ligament, the placenta dissects up the peritoneum and may adhere strongly to the great vessels, and that when rupture is intraperitoneal, the placenta may adhere

to the intestines and other viscera. Under ordinary circumstances the safest plan in either case is to remove the fetus from the sac and sew the latter to the abdominal wall, packing with gauze and allowing the placenta to loosen and come away gradually, the rule being to leave the placenta at the time of the operation. However, when it is certain that the fetus is dead, the rule is to wait longer than eight and one-half months, with the patient under close observation, before operating, and then remove the entire product of conception at once.

STRANGULATED HERNIA

By strangulated hernia is meant a rupture that is so tightly constricted as to interfere with the function and circulation of the bowel, and that can not be readily reduced. It is a very common accident, in children and in adults, and in rare exceptions, occurs in those who have had a hernia for some time.

Symptoms

Usually after a fit of coughing, sneezing, or straining at stool, the patient is suddenly seized with a sharp pain over the seat of the hernia. The pain, while acute, is often remittent, or of a colicky nature, and later may become excruciating.

In the case of an old and heretofore reducible rupture, the patient finds the mass probably a little larger or more tense, and can not be returned to the abdomen. At first there may be little or no soreness over the site of the hernia, but very soon in inguinal, or femoral hernia, the tenderness extends over the whole or lower part of the abdomen, followed by more or less symptoms of shock. The patient feels faint and exhausted, and there is marked pallor, the pulse becomes feeble and rapid, nausea and vomiting soon occur, and the facial expression is indicative of serious trouble. The temperature is normal or subnormal.

Diagnosis

Where the hernia contains only omentum, the symptoms are not usually so pronounced, and the case may be mistaken for an inflamed rather than a strangulated bowel. Errors in diagnosis

are due as Keen says, "to lack of careful physical diagnosis." The most frequent varieties of strangulated hernia are inguinal, femoral, and umbilical. The term *hernia* applies properly to a "protrusion of a portion of the abdominal viscera through any opening in the muscular or bony wall;" hence we have ventral, obturator, sciatic, lumbar, perineal, vaginal, and diaphragmatic hernias. It is a very difficult matter to differentiate between an inflamed and a strangulated hernia. Since acute strangulation may occur in an obstructed hernia, and the inflammation spread to the general peritoneum from an inflamed hernia, clinically, it matters little, for any kind or form of irreducible hernia, accompanied by local signs of pain, tenderness, obstruction, nausea, and vomiting, with marked symptoms of general disturbance, should be immediately operated upon.

A femoral hernia, or strangulated obturator hernia may be so small as to escape detection, or the general symptoms may be so great as to obscure the local symptoms. Therefore, a most careful examination should be made, often under anesthesia, to determine the condition, since so many of these cases are not diagnosed until after a laparotomy for obstruction of the bowels has been made.

Hydrocele of the cord or a simple lipoma may be mistaken for a strangulated bowel, but the absence of constitutional disturbances will usually suffice to simplify matters. Strangulated hernia may sometimes be mistaken for orchitis, especially if the hernia is large and very firm. The absence of any specific infection and the possibility of locating the testes, with the patient under anesthesia, will tend to establish the difference.

Treatment

Prompt treatment is always essential to recovery. There are but two methods of procedure; first, reduction by taxis, and second, by operation.

In attempting reduction of an inguinal or femoral, or ventral hernia, by taxis, the hips should be elevated and the abdominal muscles relaxed as much as possible. No great force or prolonged manipulation should be permitted. A gentle but firm and continuous pressure should be made over the fundus of the sac with the broad hand. Kneading or pinching with the fingers

usually does more harm than good. Where there are marked constitutional disturbances or symptoms denoting strangulation, taxis should not be prolonged. If the efforts by taxis fail, warm or hot cloths should be applied and after all preparations for immediate operation have been completed, an anesthetic should be administered, and another attempt by taxis made. Should this fail, an incision should be made immediately over, or as near the constricting ring as deemed necessary.

In the great majority of inguinal hernias, the mere division of the external ring will suffice to relieve the constriction and enable the rapid and easy reduction of the entire hernia. If the strangulation has existed for several hours, or where taxis has been employed to any considerable extent, the safest plan is to open and examine the contents of the sac before reducing the hernia.

If the bowel and omentum are normal in appearance, the protruding parts may be returned to the abdominal cavity. Should the bowel, however, be of a purple color, and slightly ecchymosed, and yet not gangrenous, apply a sterile towel or pad wrung out of hot water, and note the change in appearance of the bowel. If the normal color and luster does not return, or if gangrene is present, the incision should be elongated, and the internal ring incised and bowel drawn out.

Resection should be promptly resorted to, with an end-to-end approximation, preferably with a Murphy button, and the bowel returned to the abdominal cavity. Examine the omentum, and if gangrenous or very bulky, after applying a ligature, it should be cut away near the base of the sac and allowed to drop back with the bowel. The sac is then ligated and removed, after which the abdominal incision may be closed after any of the approved methods for the radical cure of hernia.

INTESTINAL OBSTRUCTION, INTUSSUSCEPTION, VOLVULUS, MECKEL'S DIVERTICULUM

“By intestinal obstruction is meant a sudden or gradual closure of the intestinal canal, the causes of which are accumulation within the bowel of hardened feces or foreign bodies, stricture,

pressure against the bowel from tumor or abdominal growths, volvulus, or rotation of the bowel, strangulation, due to some form of hernia, and lastly, invagination of the bowel. The latter is caused by the lower portion of the ileum slipping into the cecum as the finger of a glove might be invaginated, causing thus an actual mechanical obstruction.”*

Symptoms

The most common initial symptom is spasmodic abdominal pain and constipation, which is unrelieved by purgatives and enemas. There may be diarrhea and bloody stool, especially in intussusception. Nausea and vomiting are constant occurrences and can not be relieved by gastric lavage. The abdomen becomes distended and very tender in spots. As the condition progresses, the features become pinched, eyes sunken, the pulse is rapid and there is a cold, clammy skin and other symptoms of collapse. This condition may last for a week or ten days, when more pronounced symptoms of toxemia, gangrene, and peritonitis supervene.

Diagnosis

The most characteristic symptoms in the earlier stages are visible peristalsis and persistent vomiting, abdominal distention, with lowering blood pressure, and constipation which is not relieved by lavage or enemas. It is very often a serious mistake to wait for the appearance of fecal vomiting. The x-ray may often aid in locating the obstruction. Strangulated hernia is often attended by the same symptoms as intestinal obstruction, but careful examination of the abdominal rings may reveal the hernia. Sometimes internal strangulation results from a portion of the intestines slipping through the foramen of Winslow, the diaphragm, or a slit in the omentum or mesentery, or under Meckel's diverticulum (Hughes). Fecal vomiting indicates obstruction of the small intestines. In children, intussusception is the most common cause of obstruction and may be recognized by the sausage-shaped tumor of the colon, or by digital examination of the rectum.

*Hughes: Practice of Medicine.

Obstructions due to volvulus and strictures are usually low down and may be detected by rectal examination. Marked meteorism in the right inguinal region is considered to be a diagnostic symptom of obstruction by Meckel's diverticulum.

Fecal impaction is distinguished by gradual onset and the presence of an irregular tumor along the line of the colon. (Hughes.)

Treatment

In all acute forms of obstruction which are not relieved by lavage, oil enemas and purgatives, where vomiting is persistent, and abdomen distended, an immediate operation is always advisable. This must vary according to the nature of the obstruction, location and condition of the individual case. Where the obstruction is due to impaction of the lower bowel, the rectal scoop may be employed to great advantage. It is in these cases that massage and electricity are also of value. If the obstruction can be located, the abdominal incision may be made directly over it; otherwise in the median line. In desperate cases, the first duty is often to remove the toxic material by a temporary colostomy, by opening the bowel above the obstruction. The surgeon must be prepared to make an enterostomy or resection.

EPISTAXIS

Hemorrhage of the Nose

Hemorrhage from the nose is a common occurrence and may come from a number of causes. The bleeding is often spontaneous in plethoric and rapidly developing children. It is likewise common in alcoholics and may appear during the course of acute fevers, typhoid, scarlet fever, diphtheria, whooping cough, etc. It occurs spontaneously in the aged, and may become so profuse as to cause pronounced anemia and fatal collapse. Lastly, it may result from injury, external violence, blows upon the nose, head or chest, fracture of the nasal bones, or from abrasions and ulcers.

DIAGNOSIS

The history of the attack and the general physical condition of the patient, with a careful examination of the nasal passages,

will usually suffice to determine the origin of the hemorrhage. Nose bleeding from local causes is usually unilateral. Ordinarily the bleeding, especially in the young, is not sufficiently severe to cause constitutional symptoms, and fatal results are extremely rare. In suppressed menstruation the hemorrhage may be vicarious. Less commonly it may be caused from cardiac hypertrophy or valvular disease, and finally it may be impossible to assign a cause for its presence.

TREATMENT

When the bleeding occurs spontaneously, it is sometimes important to determine wisely as to the necessity of arresting the hemorrhage. The incidental and temporary flow of blood tends to relieve blood pressure, local and general congestion, headache, etc., hence does not require surgical interference. In general, the hemorrhage should be arrested when it appears persistent or by

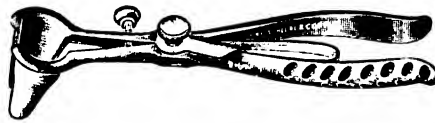


Fig. 74.--Curtis' nasal speculum.

its severity or frequency it begins to produce symptoms of anemia or exhaustion.

Simple measures should be first employed. Place the patient in a sitting position, the head inclined slightly forward. Cold applications, ice water, etc., to nose, forehead, or back of the neck is often effective.

The bleeding may often be arrested by continuous and firm pressure of the finger on the upper lip, especially at the base of the nose; and pressing the ala of the affected side against the lower border of the septum is also frequently effective; the pressure not being released until the hemorrhage ceases.

Should these measures fail, no time should be lost in ascertaining the exact source of the hemorrhage. By means of a nasal speculum (Fig. 74), head mirror, and artificial light, the bleeding point can be readily located. In 90 per cent of all cases, it will be found on the anterior portion of the cartilaginous septum, the

spot known as Kiesselbach's area. This spot will be found about a quarter of an inch within the vestibule and an equal distance from the floor of the nose. The mucous membrane here is very thin, and the little vessel (a branch of the internal sphenopalatine) anastomoses with a branch of the superior coronary. The junction sometimes is marked by a distinct varicosity. This vessel has been called the "artery of epistaxis."

The nasal cavity should be cleaned with a solution of hydrogen

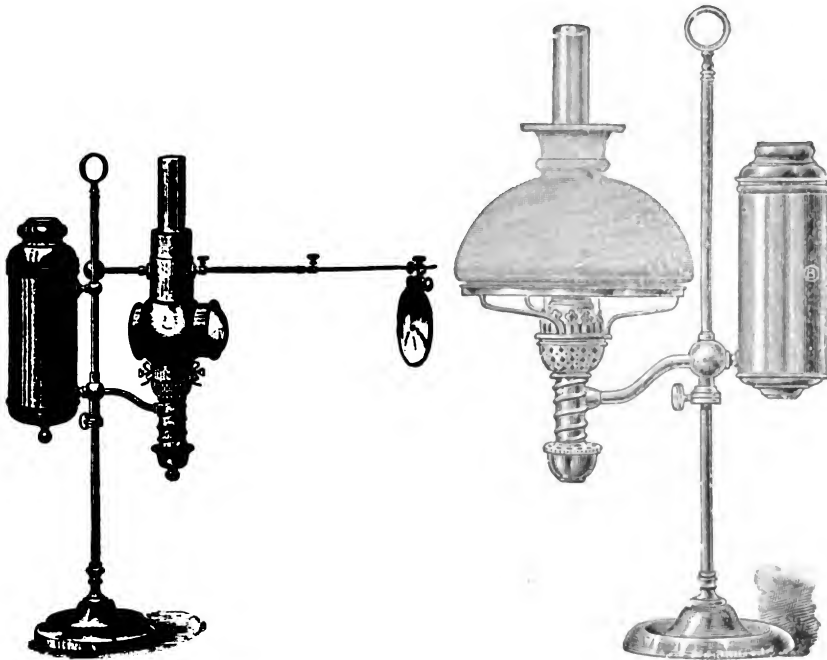


Fig. 75.

Fig. 75.—A convenient lamp condenser and mirror for nose and throat treatment when electric light is not available.

Fig. 76.

Fig. 76.—Student's lamp, for oil, adapted for condenser.

peroxide, applied on a cotton swab, and all clots removed, after which the site of hemorrhage should be touched with a 90 per cent solution of nitrate of silver, and the nasal cavity gently packed above and over the cauterized point with gauze saturated with a 1 per cent solution of adrenalin, or 10 per cent solution of anti-pyrine.

In severe and exhaustive epistaxis some form of compression is necessary. The rhineurynter was for a time quite popular for this purpose. It consisted of a small elongated rubber bag which was introduced empty through the nose and well back into the posterior nares, and then inflated.

Bellocq's postnasal cannula was also used for this purpose, but is now seldom resorted to. The nasal gauze packer (Fig. 77) is so simple in construction, and so easily applied that it is now universally used for this purpose. Sterilized or antiseptic tape may be introduced well back into the posterior nares through the cannula of the packer, and the entire nasal passages rapidly and securely packed. The gauze is allowed to remain twenty-four hours, when it should be gently removed, and after the nasal cavity has been carefully irrigated with an antiseptic solution of boric acid, if necessary, the nasal cavity may be repacked.

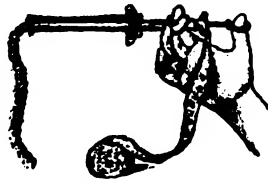


Fig. 77.—Nasal gauze packer.

Should the patient seem much exhausted from the hemorrhage, hot broths and soups should be freely given, and rectal enemas of hot saline solution, or hypodermoclysis, may be employed with great benefit. In chronic diseases or in hemophilia, gelatin or coagulose should be prescribed.

TREATMENT OF WOUNDS

Open wounds caused by accidents from machinery, street cars, automobiles, elevators, and other industrial appliances or vehicles are accompanied by more or less crushing and laceration of tissue, profuse hemorrhage, infiltration of street dirt, grease, bits of clothing, or other foreign bodies.

The first rule in the treatment of any open wound is to control the hemorrhage the details of which are described in a special paragraph on the control of arterial and venous hemorrhage.

The next step is the removal of all foreign substances from the wound by means of sterile forceps. The wound is rendered aseptic by the use of the application of tincture of iodine, freshly prepared. Ampules containing one or two drams of the tincture of iodine with a small sterile brush have been prepared by several drug firms and furnish, not only a convenient, but also a perfectly aseptic package.

The iodine should be carefully applied to all parts of the wound and over the adjacent skin. It is not considered good surgery to employ sponges of any kind or character, nor is it necessary to examine the wound with the fingers or to vigorously use a hand brush in scrubbing or in any manner add to the trauma or possibility of infection by unnecessary handling.

After the wound has been rendered aseptic, the edges, if ragged or hopelessly destroyed, must be carefully excised and the wound then drawn together by adhesive strips or metal clips. Where there is much grease or dirt ground into the wound, the author still adheres to the former method of treatment of cleansing the wound and adjacent parts with benzine, gasoline, or spirits of turpentine, followed by thorough irrigation with 1:10,000 solution of bichloride of mercury.

Ragged or extensive wounds require a small drain which may be inserted before closing the skin. This drainage may consist of a strip of gutta-percha, gauze, strand of horsehair sutures or of silkworm-gut, as preferred.

The dressings should be of warm moist gauze in all cases of infected wounds or the dry sterile gauze in clean wounds.

In infected wounds the dressings should be changed daily, but the clean wounds not oftener than once or twice a week. The metal clips or sutures should be left in place from five to ten days, the average being about eight days.

Extensive wounds may require rest of the part to insure prompt healing, and this can be accomplished by means of splints, slings, and bandages.

Where there is reason to expect infection from the tetanus bacillus, a prophylactic dose of antitetanic serum should be employed.

Control of Venous and Arterial Hemorrhage in Open Wounds

Venous hemorrhage can usually be controlled by pressure alone, and if occurring in an extremity, the limb may be kept elevated for a time. The wound having been cleansed and made as aseptic as possible, several layers of antiseptic or sterile gauze should be applied over the wound and pressure made by carefully applied bandage.

Arterial hemorrhage, however slight, is best controlled by ligation, and if profuse, and the wound small, an incision should be made sufficient in extent to enable the operator to secure the bleeding vessel. The employment of a rubber Esmarch bandage before making the incision or enlargement of the wound often facilitates location and control of the offending vessel.

SCALP WOUNDS

Incised or lacerated wounds of the scalp always bleed profusely, the parts being well supplied with arteries and veins, and it is commonly agreed that sepsis is more liable to follow wounds



Fig. 78.--Ordinary scalp wound prepared for suture. Note the clean shaving of the scalp. (Preston.)

of the scalp than those in other portions of the body. For this reason cleansing and disinfection of all scalp wounds must be very thorough.

The hair should be clipped and the parts adjacent to and around the wound shaved. The hemorrhage is sometimes troublesome,

interfering materially with the disinfection. Under these circumstances, the bleeding point should be sought and controlled temporarily with forceps; but the ligatures should not be applied until after the wound has been disinfected.



Fig. 79.—Recurrent bandage of the injured side of head with strips of adhesive applied to prevent slipping. (Preston.)



Fig. 80.—An excellent method of dressing scalp wounds.

The hemorrhage under control, the wound cleansed of hair and all foreign substances, tincture of iodine should be applied to the shaved surface, as well as to all recesses of the wound, and after

being carefully dried with sterile gauze, alcohol or ether should be applied. It is usually a good plan to place a sterile towel over the entire head, in which a slit may be made to expose the wound.

After thorough disinfection, ligatures may be inserted and the wound closed with interrupted sutures.

It is always the safest plan to leave a small piece of gauze in the lowest portion of the wound for the purpose of drainage. In more extensive injuries where the scalp is torn and the edges irregular, the tissues should be cut away to secure a better apposition, in order that the wound will heal or unite with less suppuration.

When the periosteum has been torn from the bone, without fracture, as so often happens in machinery accidents, it should be replaced, so far as possible, and held by fine sutures, allowance being made for drainage before closing the scalp wound.

After applying any needed dressing, take two-inch (or any convenient width) bandage and apply strips from front to back across head, from ear to ear, and then diagonally between. Pass one or two turns of bandage around head to cover ends of bandage strips and bare spots of adhesive. Where bandages cross at top they may be fastened with a narrow strip of adhesive. This bandage is easily and quickly applied, is light and comfortable and will stay in place. It is easily removed, as one cut of the scissors through the encircling head strip will loosen it entirely and it can be lifted off like a cap. The purpose of the first strip of bandage around the head is to keep the adhesive from sticking to the hair, otherwise it would not be needed.

WOUNDS OF TONGUE

Wounds of the tongue are not uncommon. Children are especially liable to this injury by falls or blows upon the lower jaw, or in falling with the mouth open and tongue protruding. Such accidents, while usually trivial, may be so extensive as to excise a portion of the tongue, or cut it practically in two. A lacerated wound of the tongue, from pistol shots, etc., usually causes extensive hemorrhage, and if not temporarily controlled, extravasation of blood may continue in the tissues of the tongue, producing very extensive swelling.

Treatment

Wounds in the anterior portion of the tongue being readily accessible, are easily controlled, and any large gap or incision should be sutured and brought in apposition. Keen recommends black silk in order to render the sutures visible when necessary, later, to remove them.

Injuries of the posterior part of the tongue where the hemorrhage is excessive, are far more difficult to treat; especially pistol shot wounds. An effort should be made to control the hemorrhage by drawing and holding the tongue well forward with tongue forceps. If this does not suffice, the hemorrhage may be controlled by pressure of the finger at the base of the tongue and over the wound with the tongue still drawn forward; or with the aid of a good light and mouth speculum, a ligature may be inserted and tied *en masse*, which will ordinarily be sufficient to control the bleeding. If it is not possible to apply a suture, a double tenaculum forceps, bent at right angles may be able to grasp the bleeding parts and temporarily control the hemorrhage until the mouth and throat can be cleansed of blood and thus allow the patient to safely take an anesthetic and enable the operator to secure the bleeding vessel.

In more extensive injuries where hemorrhage is profuse, and seems uncontrollable, von Bergmann recommends (Practice of Surgery, American Edition) a preliminary tracheotomy with the insertion of a tampon cannula to prevent the hemorrhage descending in the trachea. In these rare cases, the operator may be compelled to ligate the lingual or external carotid arteries in order to control the hemorrhage.

WOUNDS OF THE FACE AND LIPS

Wounds of the face and lips always involve the question of scarring and the possibility of the injury to some of the important nerves, which may destroy the sensibility of the part, and lead to further disfigurement. Wounds of the face and lips heal very rapidly and are not so subject to sepsis as those in other parts of the body.

Treatment

Wounds of the face bleed freely, and when possible the hemorrhage should be overcome by gauze pressure to avoid suturing. Wounds of the lips, as those of the face, must be brought in exact apposition, and if the cut extends through the entire thickness of the lips, the mucous surface should be closed first with a running suture of catgut, and if this can be accomplished, but two or three fine horsehair or 00 sutures should be inserted at the top, adjacent to the lip proper, to hold this part in exact apposition; and the lower section of the wound may be closed by narrow strips of oxide of zinc adhesive plaster.

In face wounds, the cosmetic result must always be observed, and hence, all dirt, or any foreign substance that has gained access to the wounds or tissues, must be carefully removed. Should the condition of the wound demand suture, subcutaneous suture of fine catgut should be used, and reinforced with oxide of zinc adhesive strips, or metallic clips may be employed, using as few as possible.

If the edges have been brought in exact apposition, the wound may be closed with a small strip of gauze fixed with collodion. If there is much oozing, a larger dressing of gauze may be found necessary. When the facial or other nerves are divided, the nerve filaments are so fine it is usually impossible to locate and unite them. All that can be done is to secure as accurate union as possible, trusting to nature to join some of the separated ends.

INDENTURES OF THE SKULL

This may be classed as one of the common accidents to infants. The elastic shell or bone of the skull in infants may become indented from external trauma without fracture. These accidents occur as a result of falls, or striking the head against some protrusion. The rapidity or degree of ossification varies very greatly in children, hence, some are more liable to indenture than others of the same age.

Treatment

Ordinarily the indentures are rectified spontaneously, or in other words, left to nature, and usually disappear in a few weeks

without any special treatment. Many unsightly indentures, however, remain throughout life, although they may cause but little or no intracranial injury. Massage, or bimanual pressure over the occiput and forehead may be resorted to with benefit. Where there is any evidence of pressure following an indenture, manifested by dilatation of the pupil, stupor, continuous vomiting, or paralysis, a slight incision should be made over the site of the indenture down to and including the periosteum. In some cases the bone can be seized with a mouse-toothed forceps and gently elevated, or a short curved uterine needle, carrying a heavy silk suture, may be forced through the outer table of the skull, and the indenture elevated by this means.

TENDONS

Division of the tendon in open wounds or cuts of the fingers, hand, wrist, and toes frequently occur, and unless repaired, often lead to the loss of the function of the part involved. The flexors of the fingers rarely unite without surgical assistance, and any delay in making efforts to repair causes the tendon to contract more and more within the sheath, and thus normal action will be entirely lost.



Fig. 81.—Fixed dressing of finger.

Treatment

When a tendon of the finger is cut or divided, as so often happens in injuries of the wrist, palm, hand, or forearm, the patient should be anesthetized as soon as possible, and after

thorough efforts at asepsis have been carried out, the wound should be incised if necessary, and the cut ends of both sides seized by proper forceps and pulled well into the wound. Flexion or extension of the distal attachment, that is, finger or toe, makes clear that the divided ends belong to each other. These ends are then carefully stitched together with fine chromicized catgut (through and through sutures are preferable), and usually two or three stitches are inserted, as the ends must be held in exact apposition to secure good union.

The wound should then be carefully cleansed and dressed, with the effort to secure union by first intention. The limb should also be placed in a splint and held in such a position as to relax the tendon while healing. After ten days or two weeks the patient should be induced to gently move the fingers, and passive movements may also be begun.

INJURIES OF THE KNEE

Gunshot and penetrating wounds of the knee joint or any other large joint, however slight, may cause serious sepsis with suppuration of the joint. Phlegmonous inflammation of the knee joint usually develops rapidly, and threatens not only the loss of the limb or its normal function, but even death of the patient. Hence wounds of the knee or vicinity of the joint, must always receive very careful attention and most thorough antiseptic treatment.

Treatment of Infections of the Knee Joint

Infection of the knee joint must be promptly recognized, and according to Senn, "The average practitioner seldom drains a suppurative joint properly. The most common mistake is too small an incision, and the employment of too small drains. No joint should be incised until the presence of pus has been demonstrated by an exploratory puncture, or by local signs and general symptoms that can leave no doubt as to the existence of intra-articular suppuration.

"The diagnosis being established, of suppurative synovitis, or arthritis, which has not yielded to successful treatment by medi-



Fig. 82.—A gunshot wound of the knee joint in a young man aged twenty-two. A large double gun wad, with 36 No. 4 shot were removed. The honeycombed patella was curetted and packed with iodoform gauze, a $\frac{3}{4}$ -inch rubber tube was inserted through the limb for drainage. The patient recovered with very slight ankylosis.

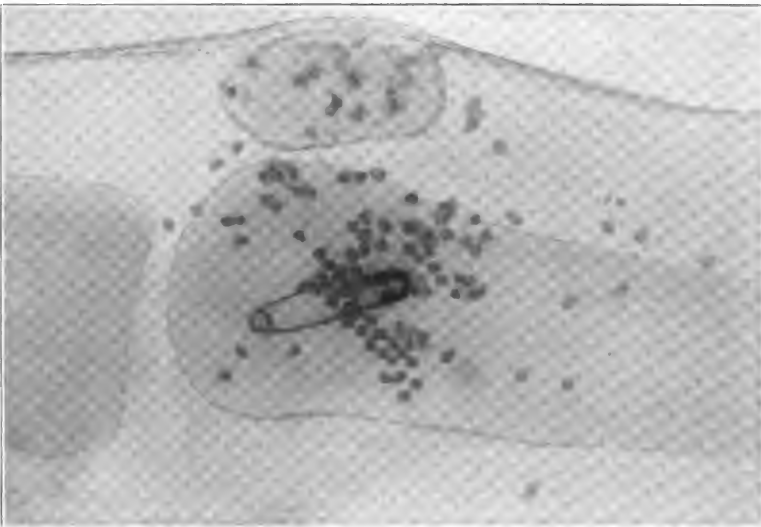


Fig. 83.—Gunshot wound of the knee.

cine and external application, the following treatment should be adopted: First, free incision; second, ample drainage; third, immobilization of the limb in a useful position; and lastly, non-toxic yet effective antiseptic irrigation."

As to the proper incision, Keen's method is as follows: An incision two or three inches long is made on both the inner and the outer side of the patella, and with the leg slightly flexed, the joint is thoroughly flushed with a 1:10,000 solution of corrosive sublimate, the wounds left open or lightly packed with gauze for drainage.

Mayo's method of gaining free access to the joint consists in an incision over the patella, sawing directly across and cutting through or dividing the patella. The joint, being thoroughly irrigated, admits of perfect drainage, but the patella later requires wiring of the bone in order to secure union, or apposition.

Dr. John B. Murphy insisted that all infected large joints, whether of the knee, hip, elbow, or shoulder, due to trauma, should be incised and carefully inspected. The joint is then thoroughly flushed with a hot 1:5000 solution mercuric corrosive chloride following which the incision should be closed by suture, accurate approximation of all injured tissue is essential, and no drainage is needed. Inject the joint with formaldehyde glycerine solution, immobilize, and put up in extension. Should temperature rise and tension become great, aspirate and inject more formaldehyde solution. If sutures do not hold and joint becomes very pussy, open up the joint at most dependent parts, drain thoroughly, and treat as an open infection.

Senn's method consists in making an incision at least an inch in length above the patella on each side of the joint. A long pair of hemostatic forceps is then inserted through one of these openings and passed obliquely through the joint to the opposite side of the tendon of the patella. Then the point of the instrument is pushed through the tissues until the skin is raised in the form of a cone. This cone is then incised at its base, the instrument pushed through the opening and the blades are expanded. With a drain firmly grasped the forceps are then withdrawn.

Another drain is inserted in a similar manner on the opposite side of the limb. Tubular drains should be employed exclusively,

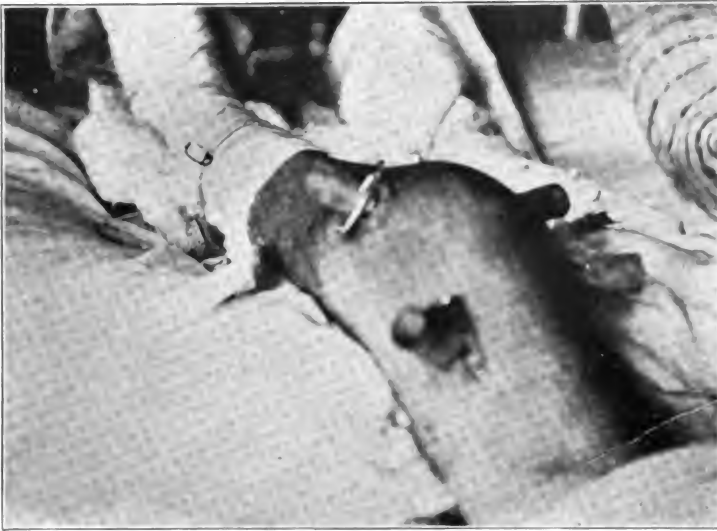


Fig. 84.—Senn's method of draining an infected knee joint.

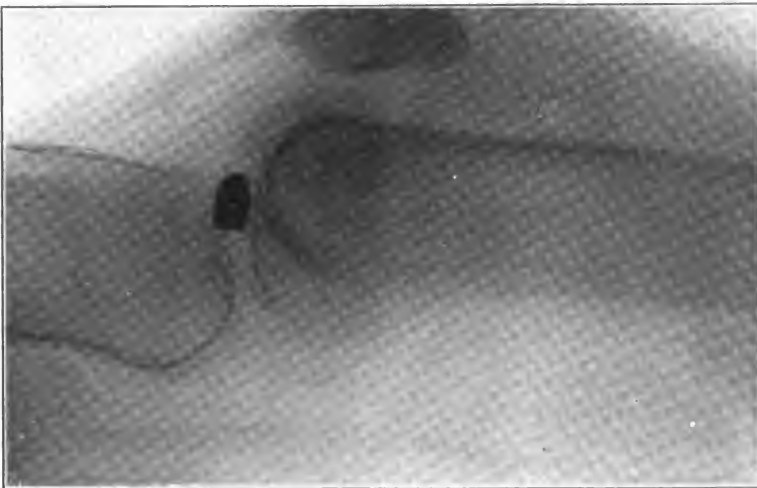


Fig. 85.—Showing 38 caliber bullet in knee joint.

and should not be smaller in size than the little finger, three-quarter-inch tubing being preferable for any of the larger joints.

Immobilization

Immobilization of the limb is of the greatest importance. For a number of years the author has employed a modification of Cabot's splint (Fig. 86).

The steel bars should be flexed at the proper angle, and extend as high up the thigh as possible, wrapped with cotton flannel and

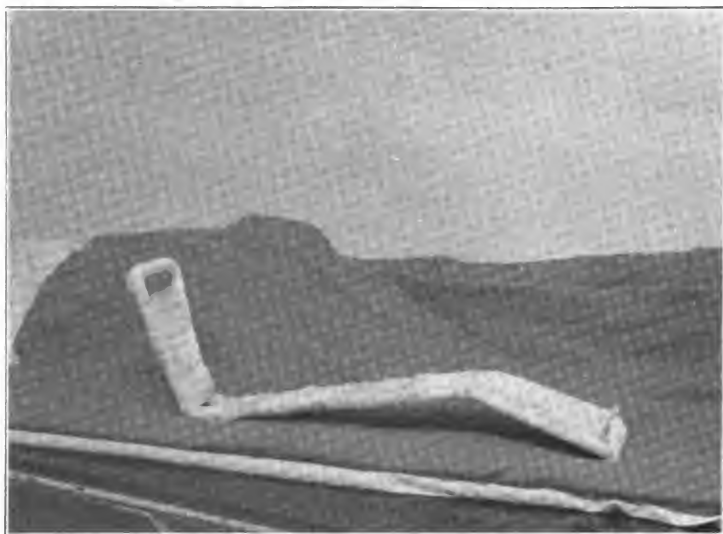


Fig. 86.—Modified Cabot splint.

covered with several thicknesses of white cotton wadding. It makes a very comfortable splint. A strip of oiled muslin extends three inches above and below the knee, to prevent soiling of the part under the knee. The splint is fixed and held in place by two and one-half inch strips of adhesive plaster, and over all a roller bandage is applied, except four inches above and below the knee, which is left open for the temporary dressings. The antiseptic gauze being placed over the injured parts, a second roll or bandage is necessary to hold the dressings in place. By this arrangement the limb may be elevated when necessary to remove

the dressing, without fear of moving the joint, or causing unnecessary pain to the patient.

Antiseptic irrigation is employed to keep the drainage tube open, as well as prevent sepsis, and for this purpose a 10 per cent solution of acetate of aluminum, or a two per cent aleresol solution may be used, both proving most effectual in our hands.

INJURIES OF SCROTUM

Injuries and contusions of the scrotum are not infrequent. Kicks, falling astride of a fence or pommel of a saddle, blows from baseballs, etc., are among the more common causes.

Severe injuries result in hemorrhage, or extravasation of blood, distending the scrotum, and also involving the perineum and lower portion of the abdominal wall; and all injuries to the scrotum are attended with severe pain, nausea, and vomiting, and other symptoms of shock.

Treatment

Slight injuries, with little swelling, usually disappear in a few days under the employment of local applications of distilled extract of hamamelis, and a suspensory bandage.

All open or lacerated wounds of the scrotum require the most rigid and thorough sterilization to prevent sepsis, and in large wounds, care must be taken to prevent prolapse of the testis. The wounds should be closed sufficiently by suitable stitches to retain the testis in place. It is often impossible to sterilize the scrotal tissues, hence provision should always be made to secure ample drainage. The patient should be kept in the recumbent position, and the scrotum elevated with a suitable bandage. Hot, moist, antiseptic dressings (5 per cent solution aluminum acetate, or boric acid) are very soothing and hasten resolution.

In injuries of the testis, where hemorrhage occurs within the tunica vaginalis, the blood clot is usually absorbed, but should infection follow, or the tunica become greatly distended, it may become necessary to open the sac and evacuate the clot, in which

case the tunica should be stitched to the skin and a gauze drain inserted.

PROLAPSUS ANI

By prolapsus ani is meant a prolapse or protrusion of the mucous membrane of the bowel from the anus. By procedentia recti is meant a complete prolapse of the whole thickness of the bowel or rectum.

Prolapsus ani is a very common occurrence, especially in young children, causing at times a great deal of alarm to the parents, as well as distress to the child. Constipation, excessive straining at stool and lack of tonicity of the sphincter, may be mentioned as the most common causes. Rectal prolapse, while it is possible to occur in children, is quite rare, and by many authors is considered merely an exaggeration of the milder form. The protruded mass is usually dark purple, or red in color, and is at first painless, but if allowed to remain for a time unreduced, or if the sphincter closes very tightly, there may be swelling, with edema and more or less tenesmus.

Prolapsus of the rectum is common to old age, and occurs mostly in men, as a result of general debility, lax condition of the rectal wall, and excessive straining, due to stone in the bladder, cystitis, and enlarged prostate, or constant coughing.

Treatment

The prolapsed portion may be readily reduced by careful, firm and continuous pressure of the well-oiled fingers, and when reduced, cold compresses or a cloth containing a small piece of ice should be held against the anus for a time to prevent return.

In children subject to frequent prolapse, the bowels should be kept loose, with mild laxatives that do not contain aloes, and they should be directed to apply cold water to the parts after bowel movement, or fresh oxide of zinc ointment applied as high in the rectum as possible with a pile pipe may be used.

In older people troubled with repeated prolapse, the milder methods may not prove effectual, hence, surgical relief, as de-

scribed in the various textbooks on this subject, may be employed with great benefit.

PARAPHIMOSIS

Paraphimosis is a very common accident in children, and occurs occasionally in adults where there is inability to draw forward the prepuce after it has retracted over the glans. Where the tight, retracted prepuce remains for a short time back of the corona, it causes very characteristic symptoms, severe pain and swelling, with more or less edema or dropsy. As the constriction becomes tighter, the organ seems to twist more and more upon itself, causing mechanically complete retention of urine, which adds materially to the distress and anxiety of the patient. The mucous fold immediately back of the corona glandis soon becomes distended with a translucent fluid, and unless speedily released, ulceration or sloughing of the parts may follow.

Treatment

When the condition has existed but a short time, the paraphimosis may easily be reduced, after being well covered with vaseline or olive oil, by means of the thumb pressing upon the glans and the fingers pulling forward the foreskin. If, however, there is much swelling or distortion of the parts, an anesthetic is necessary, after which a small, curved bistoury can easily be introduced under the constricting ring, by reflexing the glans downward and then slitting upward. The incision should be made a little to one side of the median line to avoid the dorsal vein. As soon as the inflammation and swelling subsides, circumcision should be performed to prevent recurrence. It is not good surgery to perform circumcision at the time of the reduction of the paraphimosis, owing to the danger of serious sepsis.

PHIMOSIS

By phimosis is meant inability to draw the foreskin or prepuce back over the corona glandis. The condition is usually

congenital, but may be acquired, and varies in degree from a mere pinhole to barely sufficient constriction to prevent exposure of the glans. In the congenital form the prepuce is adherent to the glans.

Treatment

The operation is a very simple one. It consists in inserting one blade of a small pair of straight scissors underneath or between the prepuce and the glans and slitting or cutting through the entire thickness of the foreskin, in the median line, care being taken not to insert the blade of the scissors into the meatus. When the incision is made, the glans is exposed, and all adhesions should be released or peeled off the glans by means of the closed blades of the scissors or a probe. The skin and mucous membrane, if need be, should be slit back far enough to freely expose the entire corona, and all smegma removed. The redundant prepuce may be removed, but sufficient should be left to protect or cover the glans. In young infants no stitches are required. In older patients any bleeding point should be closed by forceps pressure, or torsion, and a few fine catgut sutures inserted to keep the mucous membrane in apposition with the cuticle. Dressings with sterile vaseline are usually all that is required. The nurse in charge should not neglect to expose the entire glans two or three times daily for a few days to prevent the recurrence of adhesions or constriction while healing. In acquired phimosis, circumcision may be necessary.

PUNCTURE WOUNDS OF THE UTERUS

Accidents sometimes happen during self attempts at performing abortion, and there are a number of cases on record where hair-pins, knitting needles, and catheters used for this purpose have been thrust through the uterus or vaginal wall and have produced fatal peritonitis. The author recalls a case where a young surgeon in using a uterine dilator for the purpose of performing a curettement, supposed the patient was fully anesthetized, when she suddenly assumed a sitting position, forcing the dilator through the fundus of the uterus, necessitating a hysterectomy, which for-

unately saved the patient. That perforation of the uterus may occur during a reckless curettement is also known as a possibility.

Treatment

Since infection is so prone to follow this class of injuries, the author believes the only safe course where a perforation of the uterus or vaginal wall is known to have occurred, is to perform an immediate laparotomy, since ocular inspection alone can reveal the course, extent, and condition of the tissues involved in the injury, and enable the surgeon to determine the treatment necessary to recovery. In many instances closure of the punctured wound and toilet of the peritoneal cavity may suffice, but if more radical means are called for, they may be performed before a general and fatal infection has become established.

PUNCTURE WOUNDS FROM NAILS, GLASS, FISHHOOKS, ETC.

Punctured wounds of the sole of the foot from stepping on rusty nails, glass, etc., are very common, and the laity should be taught that aseptic treatment is far better and safer than fat pork, bacon rind, or a quid of tobacco.

Treatment

After thoroughly cleansing with soap and water, and drying the parts carefully with sterile gauze or towel, the place of puncture should be anesthetized by ethyl chloride spray or Schleich's solution, and the wound incised sufficiently to enable the attendant to reach the lowest depth of the wound. Tincture of iodine, followed by turpentine, applied by means of a pipette to the lowest depth, and all parts of the wound, is usually all that is necessary; after which, a small gauze drain should be inserted to keep the wound well open and prevent skin closure. It is the pent-up fluid that causes pain and renders infection more liable to occur. Moist bichloride, or carbolated dressings, changed every four to six hours, will prevent pain and encourage rapid healing.

The barefooted child in summer is especially liable to puncture

from glass. Wounds of this character should always be examined with the x-ray, and all particles of glass, if present, removed, after which the wound may be disinfected and dressed as already described for punctured wounds from nails, etc.

Fishhooks also very often cause anguish to the young anglers by becoming embedded in some part of the skin, the tip of the ears, or fingers being favorite localities. To attempt their removal by incision often fails. The best plan, under local anesthet-



Fig. 87.—Splinter forceps.

ics, is to grasp the shaft of the hook with a pair of needle forceps and push the point and beard of the hook on through and out at the nearest point, then with a pair of nippers cut off the beard and point, and withdraw the hook shank.

Removal of splinters is not always a simple matter. The splinter forceps can often be used to advantage.

Where the splinter, however large, pierces the entire cuticle, it moves very readily and is easily lost in the subcutaneous fascia,



Fig. 88.—Esmarch's tourniquet.

and hence it is the author's custom, after locating the splinter, to apply an Esmarch bandage as close as possible above and below the splinter, in order to hold it steadfast beneath the skin before making the incision for its extraction. Ethyl chloride hardens the skin in freezing and thus often materially interferes with locating the splinter. Schleich's infiltration is, therefore, preferable in this class of cases. Removal of needles from the subcutaneous tissues, even with the aid of the x-ray, is very frequently attended

with difficulty. The author has greatly simplified the matter by the following plan:

After taking the skiagraph and locating the needle, the position of the needle is marked on the skin with a pencil and the Esmarch bandage is applied to render the field bloodless and hold the needle in its place. After applying the Esmarch bandage, a fluoroscopic examination is made to determine whether or not the needle has migrated or changed position. If not, the skin is incised exactly at right angles to the buried needle, a very careful, gentle dissection or separation of the tissues is then made, extending down until the click of the needle against the metal is heard. The needle is then grasped by forceps and gently pushed through and out the skin without further mutilation. Care is necessary to prevent breaking the needle. A general anesthetic is nearly always necessary to the successful removal of needles.

Stimpson, of Philadelphia, finds that a magnetized needle holder or small forceps, following the skin incision, is quite useful in locating needles or pieces of needles buried in the muscles or tissues. Any needle holder may be magnetized by placing it on a dynamo for three or four hours. The magnetic properties are not affected by boiling.

INJURIES OF THE EAR

Owing to its prominence, the external ear, or pinna, is liable to contusions, cuts and bruises, varying from slight injuries to tearing off of the entire pinna. Gunshot wounds and other accidents from firearms are not uncommon.

The cuts of the external cartilage or the lobule of the ear may require through-and-through suture, followed by the ordinary aseptic dressings, and when the parts are held in apposition, heal quite rapidly.

Injury of the auditory canal, or internal ear, fracture of the bones therein, with bloody or serous collections within the canal, must be treated with great conservation. All modern authorities agree that local measures to render wounds of the internal ear aseptic by means of washing, rinsing, syringing or probing, are of no benefit, and more likely to do great harm, as infection is

forced into the deeper part by such means, and otogenous meningitis may result therefrom. Should blebs or bloody serum form or collect within the auricle, it is best removed with a small syringe or aspirator. Nothing else is necessary, unless there is some foreign substance which requires removal.

After the ear is dressed with dry gauze, the head is kept at rest. Should suppuration of the external auricle, with necrotic cartilage occur, the diseased portion should be carefully curetted or scraped out, to check the spread of the perichondritis; otherwise marked disfigurement may result.

Perforations of the ear drum usually heal without reaction under strict abstention, but should symptoms of otitis media appear, the ear may be dressed with small strips of sterile gauze, or a 20 per cent borated glycerine be instilled, and cold water compresses are serviceable in violent inflammation.

Manasse, of Berlin, in indorsing the "let alone" treatment, says, "It is extremely important to refrain from efforts at local asepsis with washes, and douches. No attempt should be made to syringe out the clots of blood after a fracture of the bones of the ear or base of the skull. Infection will follow such treatment, and meningitis result." He has witnessed recovery under measures made solely to promote reabsorption, even where fracture of the base had induced facial paralysis and severe disturbance in hearing and balance. To hasten absorption, Manasse employs pilocarpine in 1/6 grain daily, in divided doses; with small doses of potassium iodide. The best results can be anticipated, he says, in cases of injury of the ear, by those whose abstention in examination and treatment is most complete.*

INJURIES TO THE EYES FROM MORTAR, LIME, PLASTER AND OTHER COMBINATIONS OF LIME AND SAND USED FOR BUILDING PURPOSES

This class of injuries is exceedingly common. Their effects are not quite so rapid or acute as from unslaked lime. Nevertheless, if allowed to remain a sufficient time in contact with the eyeball, conjunctivitis and lacerations of the cornea frequently result in more or less destruction of the eyeball or cornea.

*Manasse: *Deutsch. med. Wchnschr.*, Dec., 1912.

Treatment

The fine particles should be removed as quickly as possible to prevent destructive action, and sterilized olive oil should be at once dropped into the eye, after which, the upper and lower lids being everted and turned, the bits of lime should be gently lifted away with a swab of moistened absorbent cotton.

Having removed all that can be seen, the upper lid being everted, and the lower lid being turned down by the finger of an assistant, a stream of tepid water, to which has been added a little vinegar, should be gently syringed over the front of the eye and interior surface of the lids to wash away any particles which may have escaped notice. Before closing the lids, the olive oil should be again dropped into the eye.

For the first two or three days after the injury, soothing applications and cold water dressings should be continued, or a lotion of 10 grains of boric acid to 1 ounce of aqua camphor should be applied every two or three hours. Atropine, 1 grain to $\frac{1}{2}$ ounce of water, should be instilled into the eye once or twice daily to dilate the pupil and relieve pain.

REMOVAL OF GUNPOWDER, PERCUSSION CAP PARTICLES, TORPEDOES, ETC.

One of the frequent sources of injury to the eye, in civil life, is the use of toy pistols, percussion caps, firecrackers, etc. The near explosion of gunpowder may affect the eye in several ways: the concussion, when exploded in close approximation to the eye, from burning or scorching of the surface of the eye or eyelids, from deposits in the external tissues of the eye, specks of unexploded powder, etc., or from grains of powder being driven with sufficient force to penetrate the sclera or cornea.

Treatment of Gunpowder Injuries

The first object is to remove the loose powder, if there is any, from the surface of the eye and from between the lids and the globe. In nearly all cases the local use of cocaine is necessary. After which, by everting the lids, the powder grains may be

removed by the gentle application of a moist cotton swab, and by lifting away with a small scoop or spatula any particles of powder which may be slightly adherent.

Again, it is often necessary to pick them out of the conjunctival epithelium with a fine surgical needle. The cornea should be carefully examined and all the unexploded grains which may be found embedded should be carefully removed with a needle or spud, the greatest care being employed to prevent abrasions of the cornea, which always cause more or less serious after-effects.

After taking away the powder grains, sterilized olive oil should be dropped into the eye and soothing applications of boric acid and camphor water constantly applied.

To relieve the pain and prevent general inflammation of the iris, a one or two per cent solution of atropine should be used two or three times daily as deemed necessary.

PENETRATING CUTS OR WOUNDS OF THE EYE

Small incised wounds of either the cornea or sclera, provided none of the other tissues of the eye are injured, heal rapidly and are almost harmless. Wounds and cuts, however, which are produced by glass, etc., are generally complicated by other contusions, hemorrhage, prolapse, or wounds of the lens and loss of the vitreous; and sometimes destruction of the entire globe. The danger of a corneal wound is greatly increased if the puncture extends into the ciliary region, infection being almost unavoidable, which leads to panophthalmitis and possibly sympathetic ophthalmia of the opposite eye.

Wounds in the sclerotic coat are said to be more fatal to the eye than similar wounds to the cornea. (Casey Wood.) They are sometimes difficult to heal, and if a cut is at a distance from the margin of the cornea, it will generally remain open, or patulous, and show no attempt at closing.

Treatment

Under cocaine anesthesia, all open cuts of the sclera should be closed by one or more twisted silk sutures, and if the edges come closely in contact, union will take place at once. The patient

should be kept in a darkened room and the injured eye closed and held so by a compress moistened with a saturated solution of boric acid. One or two drops of a 2 per cent solution of atropine should be dropped into the eye two or three times daily. After a few days the compress may be discontinued. Warm or cold applications are usually very soothing to the patient and hasten recovery.

INJURIES TO THE EYELIDS

Echymosis (commonly known as "black eye") is an effusion of blood into the cellular tissue of the lids and of the parts surrounding them. It may be limited to one or both eyelids or extend to the cellular tissue of the face around the orbit. The blood is generally absorbed in the course of a week or ten days, during which time the discoloration gradually fades away, but in doing so passes through a variety of shades of color familiar to all. It is uncommon for suppuration to follow.

A black eye is sometimes complicated with fracture of the nasal bone or of the frontal or ethmoidal cells. This is recognized by the emphysematous state of the eyelids and the condition of the tissue around the orbit. In blowing his nose, the patient frequently forces air through the fissured bone into the adjacent cellular tissue.

These cases, as a rule, recover without serious effects. The patient should, however, be cautioned not to blow his nose for 24 to 48 hours, by which time the fissured bone will generally be closed. Opening the integument for the relief of this condition should not be resorted to except in extreme tension of the skin, and should not be done unless the parts can be rendered surgically aseptic.

Cold applications immediately after receiving the blow will generally limit the effusion of blood and diminish the extent of the after-discoloration. A remedy which has for many years received credit is the application of raw beef steak. This may possibly apply to prize fighters, but the author has never been able to see any material benefit from its application.

Equal parts of tincture of arnica, camphor, and hamamelis, diluted one-half with hot or cold water, and kept constantly ap-

plied on absorbent cotton, held in place by a suitable bandage, favors a rapid absorption of the blood and promotes healing in these cases.

WOUNDS OF THE EYELIDS

Wounds of the eyelids may be divided into two classes: those which involve only the skin of the lid and those which have cut through the tarsal border.

The former require the same treatment as similar wounds in any other part of the integument of the body, but from the delicacy of the skin in this locality, and sometimes to avoid an unseemly scar, the edges of the wound should be brought into close apposition with fine horsehair sutures.

In laceration of the eyelid, there are two forms of injury to which its tarsal margin are exposed. First, the cartilaginous border of the lid may be cut or torn through at any part, and second, a rent may pass through the canaliculus, tearing it away from the punctum, which may still remain in contact at the extremity of the cartilage.

Where the border of the lid has been cut, the edges of the wound become slightly drawn apart. If the wound has been a clean incised one, the divided ends of the cartilage should be very accurately fitted together and fastened, preferably by a pin and twisted suture. The pin should be a very fine one and should be made to pass through the cartilage of the lid so close to its free edge that the silk union twisted on the pin will overlap the tarsal margin.

By attending to these details, an accurate union may be expected, without leaving any notch or irregularity on the border of the lid.

When the edges of the wound are jagged or irregular, as frequently happens when the lid is torn by a blunt instrument, it is the better practice to pare them smooth with a sharp scalpel or scissors before bringing the edges together with the pin and twisted suture.

When the canaliculus has been torn or cut through, a search should be made for the divided end of the tear duct, and if it

can be found, a small director should be passed into it and with a cataract knife it should be slit into the lacrimal sac. The closed tube by this means is converted into an open canal, and the tears will afterwards flow into their proper channel. The torn or cut parts are then brought into their normal position and fastened in position with one or more fine hair sutures. (Casey Wood.)

CHAPTER VI

MEDICAL EMERGENCIES

HEMOPTYSIS

Hemorrhage of the Lungs

Excluding all cases of trauma or cases in which the hemorrhage is obviously from the nasal cavity, or nasopharynx, practically all cases of hemoptysis may be grouped under three headings: first, as due to tuberculosis; second, cardiac or aortic, and especially mitral diseases of the heart; and third, as resulting from nontuberculous abscess, syphilitic ulceration, pneumonia or pulmonary infarct, aneurysm and malignant disease.

Cabot, in his work on "Differential Diagnosis," very truly says, "Practically all cases of hemoptysis which we puzzle over clinically are explained in after life to have been of tuberculous origin." In the so-called mysterious cases of hemoptysis may be mentioned vicarious menstruation. It has been demonstrated by Lord and others that what has been formerly called accidental hemoptysis occurring in young people who seemed to fully recover and in whom no pathologic reason could be located to account therefor, proved later to have been due to tuberculosis which healed without producing further symptoms.

SYMPTOMS OF HEMOPTYSIS

The expectoration of blood may appear very suddenly without premonition other than a warm, salty taste in the mouth. There may be but an ounce or two of blood, and, as a rule, the first attack or occurrence is usually limited in quantity, but in other instances the hemorrhage may be so profuse as to prove rapidly fatal, in which case consciousness may be retained almost to the last, and although the patient is unable to speak, he gasps for breath with a mute piteous appeal, distressing to witness.

In severe but less fatal cases, there is marked exhaustion, thirst, cyanosis, cold, clammy perspiration, with subnormal temperature. The pulse is rapid and feeble, and the patient's countenance is expressive of fear and impending disaster. The nervous restlessness increases the danger. The blood is alkaline and clots readily, and if swallowed, causes vomiting. It is not uncommon for the attacks of bleeding to be intermittent or recurrent in character, and the sputum may remain blood-tinged for several days.

DIAGNOSIS

Hemorrhage from the lungs may be distinguished from hematemesis by the absence of vomiting, although at times both symptoms may be present. The history of the case and the appearance of the patient, if well advanced with tuberculosis, may often aid in the diagnosis. Again, if the hemorrhage is from the stomach, a careful examination of the lungs will reveal the physical signs to be negative. The blood, if vomited, is darker in color and mixed with particles of food or other gastric contents, and, lastly, the patient can usually answer the question as to the seat of the hemorrhage correctly.

TREATMENT

In minor cases, rest in bed and seclusion of the patient will prove most beneficial. Cracked ice and small doses (5 to 10 drops every two or three hours) of aromatic sulphuric acid is all that is usually required, for, in the vast majority of cases, the hemorrhage stops spontaneously.

In the more severe types, where the hemorrhage is profuse, all tight clothing, especially around the neck, should be released, and the patient placed in a reclining position as flat as possible, and told to assist matters by resisting the tendency to cough. A hypodermic of morphine sulphate, $\frac{1}{8}$ to $\frac{1}{4}$ grain, combined with nitroglycerine, $\frac{1}{100}$ grain is given at once, and an ice bag should be placed on the chest over the seat of the hemorrhage if located. Cracked ice should also be given freely by the mouth. A few words of cheer or encouragement by the attendant are often of

great service. Atropine, $\frac{1}{100}$ grain, given hypodermically is frequently very efficient in stopping the hemorrhage, especially in tuberculous cases. Ergotine is regarded by many as contra-indicated where there is arterial hemorrhage. Emetine $\frac{1}{6}$ grain hypodermically has proved beneficial where other remedies have failed. Digitalis is of value where there is rapid heart action and also possesses some influence over hemoptysis.

Powdered alum is a popular home remedy and is of service in tonic cases. It is best given, dissolved in water, 10 grains every two or three hours. As soon as convenient, a purgative dose of magnesia sulphate should be given that the intestinal tract may be cleared, and also for the purpose of reducing blood pressure.

When the hemorrhage ceases, it is very essential to keep the patient upon his back at complete rest from twenty-four to forty-eight hours. He should not be allowed to sit up to urinate or for bowel movement. When the hemorrhage ceases, the ice bag should be gradually removed and liquid nourishment given early. Cold milk with a little lime water should be given at first, followed later with warm beef or mutton broth, and, if the patient is greatly exhausted, proctoclysis may be employed to great advantage. Artificial heat applied to the limbs and feet is often grateful and permissible.

Calcium sulphide in $\frac{1}{6}$ -grain doses four to six times daily is a popular remedy, since it has a tendency to coagulate the blood. Gelatine is also freely given for the same purpose.

After the attack has subsided, the patient may suffer from a feeling of pressure and discomfort. Dilute hydrochloric acid may be given to aid digestion, and, combined with compound tincture of cinchona, is a valuable restorative.

COAGULOSE

Coagulose is obtained by precipitating normal blood serum. It is a sterile, soluble, anhydrous powder, containing the fibrin ferment necessary for clotting the blood. It is readily soluble in cold water at concentrations two or three times that of the original serum, and possesses over fluid blood serum the great advantage of retaining its active principles unimpaired for long periods of time.

Coagulose is indicated in all cases of hemorrhage due to defective clotting of the blood, as seen in hemophilia, hemorrhage of the newborn, etc. The types of hemorrhage which have been successfully treated include the following: nasal hemorrhage, hemorrhage of the newborn, hemorrhage from gastric ulcer or duodenal ulcer, pulmonary hemorrhage, hemorrhage during and after prostatectomy, hemorrhage from the kidney, hemorrhage from the bladder, uterine hemorrhage, puerperal hemorrhage, and hemorrhages after turbinectomies and tonsillectomies.

In general, the dose consists of the contents of one bulb, but the amount may be increased or diminished as indicated, and administered at such intervals as the condition of the case may warrant. In ordinary cases of hemorrhage (nasal hemorrhage, for example) the contents of one bulb may be administered at first, and if the bleeding is not entirely controlled within half an hour, a second dose should be given within two or three hours. In all serious cases, particularly hemorrhages of the newborn, a second dose should be administered regardless of the results of the first dose. In persistent hemorrhages, three or four injections may be given daily for several days, and these should be continued for a short period after the hemorrhage ceases. In certain cases of pulmonary hemorrhage, excellent results have followed the administration of two or three doses a week for several months. It should be particularly noted that the dose is the same for infants as for adults. Considerable latitude is permissible in the administration of this product, owing to the fact that the material is apparently nontoxic.

Coagulose is supplied in 15-c.c. glass bulbs which contain 0.65 gram of the desiccated powder, equivalent to 10 c.c. of blood serum. Add to the powder in the bulb from 6 to 8 c.c. of sterile water, the temperature of which should not be above that of the blood. The water may be conveniently introduced into the bulb through the needle of a 5-c.c. or 10-c.c. syringe. The rubber stopper should then be replaced and the bulb shaken vigorously until the powder is dissolved. The solution may then be drawn up into the syringe through the needle (inverting the bulb, if necessary, to obtain the last drops). The solution may be injected subcutaneously at any convenient point.

Hemorrhage from the Stomach

HEMATEMESIS

Vomiting of blood may result from the rupture of a dilated gastric or esophageal vein, ulcer of the stomach or duodenum in chronic gastric catarrh from dilatation of the gastric vein, cirrhosis of the liver, and cancer of the stomach. It frequently follows severe injuries over the epigastrium.

SYMPTOMS

The symptoms of hemorrhage, aside from the vomiting of blood, are dizziness, faintness, pallor, rapid exhaustion, and syncope. Death may occur, but very rarely follows from the immediate loss of blood, except after repeated attacks, when the patient is already exhausted.

TREATMENT

Absolute rest in a dorsal position is necessary, and morphine sulphate, $\frac{1}{8}$ to $\frac{1}{4}$ grain hypodermically administered should be given to quiet the patient and allay the pain. The ice bag should be applied over the stomach and kept there until all hemorrhage ceases. Monsel's solution, 1 to 2 drops, given frequently with ice water; lead acetate, 1 to 5 grains; tannic acid, 10 to 20 grains; or gallic acid in combination with dilute sulphuric acid are remedies of proven value in hemorrhage due to gastric ulcer. Ergot is also of great value when other drugs are not well borne. Ipecac in small often-repeated doses or emetine in $\frac{1}{6}$ -grain doses hypodermically is decidedly effective, and, lastly, cotarnine hydrochloride (stypticin), 1 to 5 grains every four hours, is regarded as a powerful hemostatic. Of emergency or household remedies, vinegar diluted 1:4 with water is sometimes of marked value and ice in small pieces swallowed is also useful. Hypodermoclysis, or rectal enemas, of normal salt should be given to stimulate the heart. Adrenalin chloride, 10 to 15 drops, is also highly recommended, given hypodermically for internal hemorrhage. Bismuth subnitrate, $\frac{1}{2}$ dram to 1 ounce of water is at times of great service. When there is nausea and vomiting, Ewald recom-

mends cautious lavage with ice water, after cocainizing the pharynx, in cases in which death seems imminent from continuous bleeding. When all other methods fail and the hemorrhage continues, the operation of opening the stomach and direct suture of the bleeding point has its advocates. Especially is this true, in recurrent hemorrhage, which always calls for surgical interference.

DIABETIC COMA

Symptoms

Diabetic coma usually develops acutely in the terminal stages of the disease. A sudden onset of vertigo attended by sharp pain in the stomach, with nausea and frequent vomiting, and marked dyspnea, are the usual symptoms. The respiration is hurried and irregular, of a panting, distressing character, with or without cyanosis. Delirium develops rapidly, and usually within an hour is followed by coma more or less profound. The temperature is subnormal, pulse weak, thready and irregular, and the odor of acetone may be detected on the breath. To acute acetonuria is attributed the coma and sudden death of so many of these cases. Alkaline starvation as a result of the secretion of amino acid causing the production of the toxic acetone, within the body; but it must not be forgotten that diabetics are particularly liable to apoplexy.

Treatment

Intravenous injections of an aqueous solution of sodium carbonate (not bicarbonate) in 20-gram doses, with $\frac{1}{2}$ ounce of sugar or dextrose to the pint, twice a day, and high or colon enemas of the same strength solution given at a temperature of 105° , repeated every three or four hours, are frequently followed by prompt recovery. Or an aqueous solution of sodium bicarbonate, $\frac{1}{2}$ per cent, with glucose, 2 per cent, administered freely by the Murphy drip or proctoclysis method should be given at intervals for several days. To further eliminate the toxic substance from the blood, alkalies should be freely administered. Vichy water in large quantities with 10 to 30 grains of sodium bicarbonate

may be given every two or three hours, and if the bowels are constipated, a mild saline purgative should also be given. Fowler's solution in doses of 1 to 3 drops, three times a day, is a popular remedy for the anemia in this disease, and, lastly, the dietetic treatment is of far more importance than the employment of drugs, and is unquestionably the most difficult problem for the attendant physician to successfully solve.

CEREBRAL HEMORRHAGE, OR APOPLEXY

The diagnosis of apoplexy is often one of the most difficult of problems in medicine. The two conditions, thrombosis and embolism of the cerebral vessels, so closely resemble the symptoms due to hemorrhage as often to render a differential diagnosis impossible, at least for the time. The matter of most importance to the emergency surgeon is, whether or not the person lying unconscious is suffering from apoplexy, and if not, to determine the cause of the condition responsible for the coma or unconsciousness. This is often a matter of grave importance, in so far as the proper treatment of the individual is concerned.

The usual symptoms following cerebral hemorrhage are: sudden loss of consciousness, varying from mere confusion to deep coma; stertorous breathing of the Cheyne-Stokes type, conjugate deviation of the eyes, loss of control over the sphincter, which in a vast majority of cases are accompanied by a full pulse, and a very high blood pressure, 180 to 230 mm., not being uncommon. A knowledge on the part of the attendant to properly interpret motor symptoms, which soon appear after cerebral hemorrhage, will assist materially in confirming the diagnosis.

Of the various conditions which may closely resemble the comatose stage of apoplexy, may be mentioned the following:

Alcoholic Coma

This condition may ordinarily be differentiated from apoplexy by the known habits or history of the person, the odor of alcohol on his breath, and character or method of breathing, whether or not the coma is deep and breathing is stertorous, or whether pricking the soles of the feet or calves of the legs will

cause the individual to draw up or move the limbs, demonstrating the absence of hemiplegia. The face and skin of the alcoholic are cool, as compared to the hot and dry skin of apoplexy; and, lastly, the patient may often be partially aroused by the inhalations of ammonia if he is suffering from alcoholic intoxication.

Syncope

Ordinary attacks of syncope are distinguished by the pallor and feeble pulse, and the quick recovery after a stimulant is administered.

Epileptic Seizures

The convulsive movements or appearance upon the ground or surroundings, indicating that there has been a struggle, the froth or bloody mucus at the mouth, the absence of indications of hemiplegia, the age of the person, and early recovery from the symptoms, simplifies the diagnosis.

Stupor from Opium

In the stupor due to opiates we always have contracted pupils, the ability to arouse the individual by shaking, slapping, or loud shouting, and the absence of paralytic symptoms usually suffices to distinguish this condition from apoplexy.

Coma of Uremia or Diabetes

The history of kidney trouble, convulsions always preceding the coma, edema of the limbs, and other evidences of Bright's disease, with albumin in the urine, at once clears all doubt of the diagnosis. In diabetic coma the emaciated appearance of the individual, rapid and feeble pulse, sweetish odor of the breath, with the presence of sugar in the urine, establishes plainly the diagnosis. All patients found unconscious where uremia or diabetic coma is suspected, should be catheterized and the urine carefully analyzed for albumin and sugar, and examined for hyaline or tube casts, for by this means a diagnosis can often be easily ascertained.

Concussion of the brain, or fracture of the base of the skull, may often simulate apoplexy, and therefore all history of the

possible injury to the head, neck and abdomen must be excluded in our conclusion as to apoplexy.

Hysteria

Hysteria may also resemble apoplexy; but the sex, history, symptoms, and usual nervous phenomena, characteristic of hysteria, will always suffice to make the diagnosis clear.

Prognosis

In the class of cases to which the term emergency belongs are those that are found unconscious. The onset having been sudden, in this class of cases where insensibility is profound, the prognosis is far more grave than in the ingravescent or ventricular or peripheral forms, which appear more gradually, and in which there are more or less prodromes, or warnings.

If the unconscious condition be prolonged, the face pale, pulse rapid and irregular, with marked evidence of cardiac exhaustion, death is the usual terminal.

Reaction in quite a number of severe cases takes place in from two to six hours. Sensibility and reflexes gradually return, with which there is always associated headache, nausea, confusion of thought, with more or less evidences of hemiplegia, indicating that the danger has passed and that the patient may make at least a partial recovery; and, while he may live an indefinite period, he is always in danger of another attack, and rarely can he be expected to again become a normal individual.

Symptoms

Symptoms of apoplexy depend almost entirely upon their location, suddenness, and the amount of cerebral hemorrhage. When the hemorrhage takes place from the middle cerebral artery (the most pronounced type), the individual is suddenly seized with vertigo, and, if walking, is seen to stagger and fall. If observed at this time, the face will be found pallid, pulse slow and full, with high tension; the temperature will be subnormal; the pulse soon becomes rapid and irregular, dependent upon the amount of shock. In a short time the breathing becomes stertorous, and

paralysis of one side of the face, with leg and arm of the opposite side, will make its appearance, this hemiplegia being the typical paralysis of cerebral hemorrhage.

When the bowels or the bladder are full at the time of the stroke, involuntary evacuation is the rule, to be followed later by a suppression of the urine. During the stage of onset of the attack, the head and eyes are often drawn sharply to one side opposite from the paralyzed side. The pupils of the eyes are commonly dilated, the pupil on the side of the hemorrhage usually being more dilated than the other.

In that form of apoplexy where a vessel in the dura mater is ruptured (a common event in prize fighting as a result of injury to the head), the clot is formed either outside of the dura mater, extradural, or beneath the membrane, or subdural. "The noteworthy peculiarity of these cases is that the primary unconsciousness due to a blow speedily disappears; the patient may recover with normal mental state, and then after an interval varying from some minutes to several hours, he becomes heavy and dull, and finally comatose. Spasmodic movement of the muscles on one side of the body, followed by paralysis, may develop. If the extravasation of blood is large, the pupil on the paralyzed side is contracted, and that on the side of hemorrhage is dilated. This is called 'Hutchinson's pupil.' It is in this form of apoplexy that surgical interference is absolutely essential to save life."*

Treatment

During the attack, the patient should always be made as comfortable as possible, and placed in the position in which breathing is most easily carried on, the shoulders slightly elevated and turned a little on one side, with the face somewhat downward, in order that the tongue, palate, and saliva may fall forward instead of back into the throat. If the head is hot and face flushed, an ice bag should be applied and a hot mustard foot bath be given. As retention of urine is common, the patient should be catheterized at regular intervals. The experiment and studies of Cushing, of Baltimore, regarding the attempts to lessen the high arterial tension responsible for the rupture of the artery, by means

*Hare: Practice of Medicine, p. 911.

of venesection, or vascular sedatives, immediately following a stroke of paralysis, have not proved successful, and he regards such a procedure as not only useless, but possibly harmful. The author believes he has met with a number of cases where venesection seems to have been of the greatest benefit, and hence he thinks it should be resorted to promptly in selected cases—in the full-blooded and plethoric. This depletion is followed by the hypodermic injections of $\frac{1}{100}$ grain of hydrastinine every three or four hours, to assist in forming a clot and controlling further hemorrhage. Ergot and strychnine and other like drugs, have no value. Should reaction occur, general restoratives may be given as indicated, and later, absorption of the clot may be hastened to some extent by keeping the secretions active, and by the administration of potassium iodide. Change of position is often very essential to the comfort of the patient, and gentle massage or alcoholic rubs, and salt water baths, afford comfort and are also of value.

ANGINA PECTORIS—NEURALGIA OF THE HEART

True angina pectoris is usually the result of insufficient blood supply to the heart itself, obstruction or disease of the coronary arteries, dilatation or hypertrophy, adhesive pericarditis, or valvular disease. It most commonly occurs in males over forty years of age, and may be precipitated by overexertion, nervous or mental strain, or acute indigestion.

Symptoms

The characteristic symptoms are sudden, intense, agonizing pains in the region of the heart, diaphragm, neck or shoulders usually, but not always, shortness of breath, with marked depressed or disturbed heart action. The pronounced pallor or expression of the face is usually indicative of serious trouble.

The attacks usually last but a few minutes, and sudden death is not uncommon. Should the patient recover from the attack, there is always extreme prostration, vomiting, or an excessive flow of urine. Attacks of pseudoangina, occurring in nervous women, and children, come on more gradually. The stomach or abdomen is

usually distended, and eructations of gas and other symptoms of gastric irritation are present. The face in these cases is flushed, the pulse full and rapid. The pain, too, is more or less diffused all over the chest, and globus hystericus is not uncommon.

Diagnosis

The occurrence of intense precordial pain, paroxysmal in character, is characteristic of true angina pectoris, and the symptoms of cardiac depression are usually so pronounced that the diagnosis can rarely be questionable. Strumpel truly says, "It can not be denied that frequent attacks occur in heart disease that can not be distinctly classed, and a boundary line between true angina and cardiac asthma is often confusing." True angina is associated with disease of the aorta and coronary arteries. A skiagraph is often of value in establishing a diagnosis. Contrary to the general impression the blood pressure of patients subject to angina during intervals is low. In acute attacks, however, it may rise to 180 mm. A careful physical examination of the heart on recovery from the symptoms may reveal no abnormality.

Gastralgia, or intercostal neuralgia, may be mistaken for true angina, but the suffering is not so intense and the history and character of the symptoms do not indicate true angina.

Severe pain, however, in or about the heart, with paroxysmal sinking spells and anxiety, if coupled with a muffled sound at the base of the heart, or with the aortic sound more pronounced than the pulmonary, is apt to be evidence of true angina pectoris.

Prognosis

The prognosis in true angina is always grave. Although some patients suffer from these attacks for many years, the danger of sudden death is always present.

Treatment

In the treatment of a severe attack of angina the subcutaneous injection of morphine, $\frac{1}{4}$ to $\frac{1}{2}$ grain, is indispensable, and often gives prompt relief from the agonizing symptoms. Inhalations of amylnitrite, 3 to 5 minims, should also be given, followed by

the administration of nitroglycerine. This is best given in drop form, as in the following mixture recommended by Strumpel:

R Nitroglycerine	gr. $\frac{1}{4}$
Spirits of Wine	
Aqua dist.	āā fl3 ijss
M.	
Sig: 20 gtt. every 4 to 6 hours.	

Hot applications to the chest or a hot general pack may prove serviceable. Compound spirits of ether (Hoffmann's anodyne) in $\frac{1}{2}$ - to 1-dram doses, is of marked value in hysterical cases. Nitrite aconitine $\frac{1}{300}$ -grain doses thrice daily is regarded as curative. Sodium nitrate 1 to 2 grains or Fowler's solution 5 m. after meals, are of value in preventing paroxysms. Diuretin is also a popular remedy, and may be given in 10-grain doses as a prophylactic. On recovering from the attack, the exciting cause should if possible be determined, and tonics and restoratives given as indicated.

ACUTE INDIGESTION

By many physicians the term "acute indigestion" is made applicable to, or synonymous with, certain forms of gastralgia, toxic gastritis, acute atony, acute dilatation of the stomach, or, lastly, acute ectasia. (Kemp.)

In the pronounced or severe type of acute dilatation of the stomach, the condition may be mistaken for angina pectoris, perforation of the stomach or duodenum, intestinal obstruction, or peritonitis.

The causes of ectasia are indiscretions of diet, indigestible food, infectious diseases, pneumonia, typhoid fever, scarlatina, injury to the head or spine, injuries to the abdomen, toxemia, or auto-intoxication.

Symptoms

The onset is usually sudden. There is intense pain in the stomach, accompanied with rapid distention of the stomach. Vomiting is almost always a constant symptom, but is sometimes intermittent; hence, cessation of vomiting is not always a favorable symptom. At first the vomit consists of the contents of the stomach, usually but partly digested or in a fermented state. The

vomited matter may be greenish in color, brown, or inky black. The bowels are usually constipated, thirst is intense, and urine suppressed or very scanty. The temperature is usually subnormal. Tachycardia is common, with symptoms of cardiorespiratory exhaustion and collapse. Hiccough may occur as a terminal symptom, with delirium and convulsion. Muscular rigidity is absent and percussion will reveal the extent of the dilatation.

Prognosis

Unless recognized early, these cases are bad, and present a formidable condition, the death rate being very high. Our present knowledge of the proper method of treatment should greatly reduce the mortality.

Treatment

The stomach in every case must be immediately evacuated by lavage, and the stomach thoroughly washed out with an alkaline solution, sodium bicarbonate $\frac{1}{2}$ oz. to 1 pint of water, or 2 oz. milk of magnesia to 1 pint of water. It is often advisable to repeat the lavage in two or three hours. The administration of a hypodermic injection of morphine, $\frac{1}{8}$ to $\frac{1}{4}$ gr., with atropine $\frac{1}{150}$ gr. or $\frac{1}{100}$ gr. atropine alone should be given to control the severe pain and procure rest. Later, 3 to 5 gr. of calomel should be given, followed in four to six hours with a saline cathartic, magnesium sulphate, 1 oz. to 8 oz. of water, preferably given through the stomach tube. For the extreme thirst and exhaustion, enemas of hot saline solution or hypodermoclysis may be administered. Rectal feeding is essential until all symptoms disappear, when the patient may gradually be placed on soups and broths. Patient should also be instructed to lie flat upon the abdomen, as this position often affords marked relief.

INTESTINAL COLIC

Intestinal Neuralgia, Enteralgia

Intestinal colic may be defined as spasmodic contraction of the muscular coat of the intestines. The pain, paroxysmal in character, is sometimes excruciating.

Causes

Intestinal indigestion from improper or poorly cooked food, unripe fruit, exposure to cold, etc., are the causative factors.

Symptoms

Sudden and severe pain in the abdomen, centering around the navel, accompanied by nausea, flatulence, faintness, and cold perspiration. If pain continues for some time, exhaustion is marked and the pulse becomes rapid and feeble.

Diagnosis

The absence of temperature and local pain and tenderness in the right iliac region, especially when associated with disorders of indigestion, usually suffice to distinguish colic from appendicitis. The position the patient assumes is often indicative of colic, since lying upon the stomach or continuous pressure over the abdomen tends to relieve the pain. In renal or nephritic colic, the pain is often characteristic, and follows the course of the ureter of the affected side. Ovarian colic or neuralgia may be distinguished by the local symptoms and the fact that pressure over the ovary intensifies the pain, and there is always a history of menstrual disorder. Biliary colic is known by the pain being localized over the hepatic region, accompanied by retching and vomiting, followed later by jaundice and other symptoms of hepatic trouble.

Treatment

Morphine, $\frac{1}{6}$ to $\frac{1}{2}$ grain, hypodermically, or, as many prefer, $\frac{1}{100}$ grain atropine sulphate, with hot applications to the abdomen will usually relieve the pain, and as soon as possible thereafter the patient should be given a purgative dose of castor oil or magnesium sulphate to clear the intestinal tract and prevent return. Spirits of chloroform $\frac{1}{2}$ to 1 dram, repeated at short intervals, is very effective in those who can not take morphine. Later the bowels should be regulated by proper laxatives, and digestive tonics may be given with benefit. Intestinal colic in infants may be relieved by the following:

R	Spts. chloroform	℥ xl
	Sodium bicarbonate	3 ss
	Aqua anisi q. s. ad	3 iii

M.

Sig.: $\frac{1}{2}$ to 1 teaspoonful every hour until relieved, to an infant of 3 to 6 months, followed later by a laxative, and correction of the diet.

RENAL COLIC

Kidney Calculi.—Renal colic results from the passage or attempts at expulsion through the ureter of small concretions commonly called “gravel” or kidney stones. It occurs at all ages in both sexes, but seems more common in females.

Varieties of Calculi.—In children or young people the calculi are usually composed of ammonium urate, the urine being alkaline in reaction.

In rheumatic or gouty individuals, we expect to find uric acid gravel and the urine is acid in reaction.

In older people is found a hard, rough, dark colored oxalate of lime or mulberry stone. The phosphatic calculi is white and chalky in appearance, similar to those usually found in the bladder. The urine is usually alkaline in reaction.

Symptoms

Renal colic is characterized by severe, excruciating pain principally in the dorsolumbar region, and follows the course of the ureter of the affected side. Strangury is common, with nausea and vomiting, cold, clammy skin, and symptoms of collapse. When the renal colic subsides, which it usually does in from 1 to 6 or 8 hours, there is always more or less soreness and tenderness over the kidneys and abdomen, which may remain for several days. Where the stones fail to pass through the ureter and remain for some time in the pelvis of the kidney, they cause more or less local irritation, with symptoms of backache and hematuria, and should the calculi become impacted, the urine is scanty, of a high specific gravity, with albumin, casts, and pus as a result of pyelitis.

Diagnosis

The pain is usually characteristic, but may be confounded in young women with ovarian neuralgia, and it must not be overlooked that a Meckel diverticulum involving the sigmoid has been mistaken for renal colic. Repeated attacks of renal colic with hematuria, albumin and other evidences of suppuration, or pyelitis, are positive evidence of kidney stones, which should be confirmed by x-ray examination.

Treatment

Morphine, $\frac{1}{6}$ to $\frac{1}{2}$ grain, hypodermically, repeated if necessary in one to two hours, usually suffices to relieve the pain, although chloroform by inhalation may be required in prolonged and severe cases. Hot applications or a hot sitz-bath is often beneficial, and alcoholic stimulants, camphorated oil hypodermically, or Murphy's proctoclysis, may be employed to sustain the strength of the patient. Later, if the urine is alkaline, acidulated drinks and benzoic acid are indicated. If the urine is alkaline in reaction, Vichy or lithia water, with potassium bitartrate should be given as a prophylactic. Pronounced symptoms of pyelitis and suppuration, as evidenced by chills, irregular fever, profuse sweating, etc., demand or call for surgical relief.

BILIARY COLIC

Cholelithiasis.—Biliary colic is distinguished from renal and intestinal colic by the location of the pain, and such additional symptoms as jaundice, distended gall bladder, or characteristic gray stools, and the presence of bile in the urine. The pain and tenderness may extend to the left of the median line, but rarely radiate downward to the umbilicus.

Treatment

Morphine, $\frac{1}{6}$ to $\frac{1}{2}$ grain, or atropine sulphate, $\frac{1}{100}$ grain, is often necessary to control the pain. Many prefer spirits of chloroform in $\frac{1}{2}$ - to 1-dram doses, repeated at intervals of one-half hour until relieved. For the nausea and vomiting, small

doses of calomel, $\frac{1}{20}$ to $\frac{1}{10}$ grain may be given with benefit. Later, saline laxatives should be administered to relieve local congestion and engorgement of the intestinal tract. Sodium phosphate in 20-grain doses three or four times a day is popular with some physicians, and is employed when the acute symptoms subside, to stimulate the secretion of bile and overcome the condition of jaundice. It is best given dissolved in a half glass of hot water.

LARYNGITIS STRIDULOSA

There is nothing more alarming to members of a family than for a child to waken suddenly from a quiet sleep to find breathing almost impossible. It struggles frantically, and the asphyxia becomes more pronounced until the child loses consciousness, and convulsions ensue.

Symptoms

The child may have been in good health on retiring, but awakens suddenly with a dry, metallic croupy cough, always attended with dyspnea, the lips and finger nails become blue, the countenance anxious, and the struggle for breath may be pitiable to witness. Involuntary discharge of the feces or urine may occur, the intermittent character of the paroxysms, the absence of temperature, sudden onset and peculiarly dry, crowing inspirations serve to differentiate the condition from true croup, diphtheria, or other laryngeal conditions.

Treatment

A few drops of ether or inhalations of chloroform will usually relax the patient and afford immediate relief. A hot general bath with applications of hot water to the throat or a mustard plaster to the back of the neck is often of benefit. One to three drops of Comp. Stillingia liniment given on loaf sugar and repeated in 15 to 20 minutes frequently affords instant relief. Potassium bromide, a teaspoonful dissolved in half a glass of water, and given a teaspoonful every ten or fifteen minutes until the paroxysms are relieved, is a most excellent remedy, and if the patient is very much exhausted, nitroglycerine in $\frac{1}{150}$ -grain doses, or brandy in the form of a hot sling, will prove of great benefit. A laxative dose

of calomel, $\frac{1}{2}$ grain, santonin $\frac{1}{2}$ grain, should be given. After the attack, the tendency to recurrence can be prevented by moderate doses of potassium bromide given as follows:

R Potassii bromidi	3 iss
Syr. aurantii	fl3 i
Aqua menth pip q. s. ad	5 iv
M.	
Sig.: 1 teaspoonful 3 or 4 times a day.	

OPHTHALMIA NEONATORUM

Ophthalmia neonatorum is an acute, destructive inflammation of the eyes of the newborn child. It makes its appearance during the first three days after the birth, the infection being introduced during the passing of the child's head through the vagina. In the majority of cases it develops in one eye a few hours before the opposite one is invaded, hence prompt treatment may often prevent the involvement of the second eye. Should the infection not occur for a week or ten days following confinement, the inflammation is usually of a milder character, and from a different cause, and may be classed as acute catarrhal ophthalmia, provided the presence of Neisser's gonococci is negative.

Characteristic Symptoms

The first noticeable symptoms of ophthalmia neonatorum are a slight redness of the conjunctiva, accompanied with a sticky discharge which accumulates in the corner of the eye. The redness increases rapidly, and in a short time the lids become swollen or puffy and shiny. The discharge becomes copious and the lids agglutinate, or stick together. The discharge, at first of a watery character, soon becomes profuse, and is of a yellowish or cream color. The conjunctiva becomes more and more congested, intensely red and edematous, a condition known as chemosis or infiltration, and intense congestion of the conjunctiva. The cornea soon becomes hazy or dull in appearance, and when this occurs, one or more small ulcers soon appear upon the cornea; and if the disease is not overcome by treatment, the ulcers deepen and perforation takes place, commonly near the periphery of the cornea, and the iris protrudes and becomes entangled with the

wound. Should resolution now occur, it produces a condition called anterior synechia, resulting in a dense white star, or the cornea may be rendered so opaque as to cause total blindness.

A general inflammation or panophthalmitis may also occur in neglected cases, due to the infection spreading or invading the deeper tissues of the eye, ending in staphyloma and destruction of the eyeball.

Treatment

Prophylactic.—Cleanliness is the greatest of all factors in the prevention of this most disastrous of eye diseases. The eyes of the newborn should be carefully looked after for some time after birth, and the hands of the nurse should always be surgically clean when caring for the child's eyes and sterile gauze or cotton always used. A mild solution of boric acid may be used in wiping and cleansing the baby's eyes. In suspected cases of infection, Credé's method of prevention should always be employed; viz., "As soon after birth as possible the child's eyes should be carefully wiped with sterile gauze; the eyelids opened, and with a sterilized pipette or medicine dropper, 1 drop of a 2 per cent freshly prepared solution of nitrate of silver in distilled water, should be carefully dropped in the conjunctival cul-de-sac."

Parke, Davis & Co. have recently introduced ampules of a carefully prepared and sealed 2 per cent solution of nitrate of silver which may be preserved indefinitely and as a matter of convenience should always be carried in the obstetric case.

Treatment of the Inflammation

Frequent irrigation and cleansing of the eye by means of an Ellwood irrigator bottle, or a carefully sterilized common syringe with a glass pipette or tip is always an essential feature in the treatment. With sterile fingers, the eyelids should be separated and gently opened and elevated, in order that the upper and lower cul-de-sacs may be readily reached and washed out. Wipe away with pledgets of sterile cotton all pus or discharge. The irrigation should be repeated every two or three hours according to the severity of the case, and it requires at least two persons to carry out the measures successfully.

The following solution has proved satisfactory and should always be used comfortably warm:

R	Boric acid	gr. lxxx
	Sodium bicarbonate	gr. xxx
	Aqua camphor, U. S. P.	℥ iv
	Aqua dist. q. s. ad.	℥ viii

M.

Sig.: For an irrigation.

After thorough irrigation, the lids are carefully dried and a drop or two of a 2 per cent solution of silver nitrate should be introduced every 4 to 6 hours into the culs-de-sac; after which the edges of the lids should be carefully anointed with sterile vaseline or yellow oxide of mercury, 1 per cent, especially prepared for ophthalmic purposes and put in collapsible tubes, which can be purchased from a number of pharmacists. Sterile cotton wet with the above solution may also be applied over the eyelids, and should be changed frequently.

Should the disease advance in spite of this treatment and the discharge become more copious, a 20 to 40 per cent solution of protargol or argyrol may be used as follows: After irrigation and cleansing, the lids are carefully everted, dried with sterile cotton or gauze, and the solution of protargol applied to the under surface of both lids with a small cotton swab or applicator. This should be repeated every six hours. Should the cornea become involved, a 1 per cent solution of atropine should be instilled sufficiently often to keep the pupils well dilated. As the inflammation lessens, the swelling of the lids gradually disappears and the conjunctiva assumes its normal color. The child must be protected from a bright light for several weeks. When all inflammatory symptoms disappear, a 2 per cent solution of antipyrin may be employed with benefit to clear the cornea and strengthen or accustom the eye to light.

HICCOUGH

Persistent hiccough in the majority of cases is a result of irritation of the peripheral distribution of the phrenic nerves, from indigestion or abnormal gastric fermentation or similar local

causes acting reflexly on the nerve centers in the medulla. It is often a hysteric manifestation excited by fright or emotion. Again, persistent hiccough may be associated with rheumatism, typhoid fever, and other febrile diseases, and when occurring in pneumonia of elderly people the patients rarely recover. It may follow abdominal operations, and in peritonitis with abdominal distention it is usually indicative of fatal issue. Lastly, it commonly occurs in the later stages of carcinoma of the stomach and bowels, and is often present in uremia.

Symptoms

In simple attacks resulting from intestinal irritation, indigestion, etc., which last at the longest an hour or two, there is usually little or no pain, but when the hiccough persists for hours, days, or weeks, it may become a serious matter, and menaces life through loss of sleep and inability to take the proper nourishment. Occasionally the diaphragmatic spasms are intermittent in character, or cease during sleep, but the patient soon becomes exhausted with the pain and soreness of the abdominal and intercostal muscles, and the sudden jerking and peculiar noise made by the constant hiccoughing is a source of much annoyance.

Prognosis

In hysteric cases and in simple gastric disturbances where there is no acute disease or organic trouble, the prognosis is always favorable, but persistent and uncontrollable seizures occurring in acute disease or in the latter stages of organic troubles may be so distressing that death may result from exhaustion after six or eight weeks of continuous hiccough.

Treatment

In hysteric cases pulling or drawing out the tongue with the tongue forceps, holding the breath, or other simple means, will usually suffice to stop the hiccough. In gastric disturbances, gastric lavage followed by a brisk cathartic will prove beneficial. In the more pronounced cases, many remedies may be tried. Du-boisine sulphate, $\frac{1}{100}$ to $\frac{1}{50}$ grain, has been employed in obsti-

nate cases with good results. Pilocarpine nitrate, $\frac{1}{8}$ to $\frac{1}{2}$ grain, has been highly extolled in desperate cases, and apomorphine, $\frac{1}{20}$ to $\frac{1}{10}$ grain, may be used where other remedies fail. This class of drugs is administered hypodermically. Sulphonal or chloral are indicated where hypnotics are indicated. Spirits of chloroform, 10 to 20 drops, is a popular remedy. The old fashioned prescription of Hoffman's anodyne and comp. tr. cardamon, equal parts, of which 20 drops is given every hour and allowed to dissolve slowly in the mouth, the author has found of especial value. Strapping of the chest with adhesive strips as for a fractured rib, is often of very great benefit; and lastly, morphine, hyoscine, or scopolamine may be given hypodermically when all other remedies fail.

CHAPTER VII

MISCELLANEOUS EMERGENCIES—PARAFFIN METHOD OF TREATING BURNS

PTOMAININE OR FOOD POISONING

(Including botulism, allantiasis, or sausage poisoning, etc.)

Much has been written on the subject of ptomaine poisoning, and the subject has excited more or less interest among the laity, owing to the frequent reported cases of poisoning resulting from the eating of diseased "food products," canned goods, putrid meats, diseased pork, fish, cheese, milk, ice cream, etc. Confusion has existed over this subject of "food poison" among medical practitioners in the past, owing, first, to their inability to determine the poisonous principle or exact toxic agent responsible for the condition, for even in fatal cases, no appearance was discovered after death to account for the result; and, second, poisoning resulting from the various food products especially ordinary meats, game, fish, beef, pork, mussels, and other shell fish, gave rise to such a wide difference or variance in symptoms as to render the treatment wholly empirical and unsatisfactory.

The form of food poisoning familiarly associated with ptomaine poisoning may be best described as follows: Intense colic or gastric pain, violent vomiting, exhaustive diarrhea, high fever, and symptoms of collapse resembling that of severe cholera morbus.

The treatment of this form of ptomaine poisoning consists essentially in efforts to eliminate the poison by means of purgative doses of calomel or castor oil, and the hypodermic administration of morphine to control the pain, and later, general tonics and restoratives.

Modern bacteriologists have now established the fact that in the vast majority of cases poisoning resulting from the eating of diseased food products are attributable to infection by toxic microorganisms varying in violence and each producing well-defined and distinctive clinical characteristics. Bainbridge states

that after much research he had been unable to find any instance in which the presence of ptomaines in meat had been demonstrated which had caused poisoning; hence, definite proof that a given case of meat poisoning is caused by ptomaines is very difficult to obtain, and a diagnosis rests mainly on the absence of other possible causes of the illness. The principal symptoms of true ptomaine poisoning already described as being similar to those of cholera morbus, are usually of short duration. The onset of the illness occurs very soon, rarely later than four to six hours after the poisonous food is eaten, and the majority of cases of meat poisoning are due to infection from the bacillus enteritidis or *B. suipestifer*, and ordinarily follow eating of uncooked meats, chiefly during the summer months or autumn.

The period of incubation from infection by the *B. suipestifer* is between six and twenty-four hours. The illness often begins with a severe headache, or chill, followed by acute gastric disturbances, nausea and vomiting, diarrhea and abdominal pain. In the more severe cases there is great prostration, restlessness, extreme thirst, muscular cramps and tremors, and death may be preceded by coma. Fever is usually present but rarely rises above 102° or 103°. The average cases where recovery takes place last about a week or ten days.

The other type of bacterial infection from *B. enteritidis* is much more deadly and all symptoms are aggravated. Postmortem examination shows intense redness and swelling of the mucous membrane of the stomach and intestines, with minute ulcers which are not confined to any special portion of the alimentary canal. The bacilli are found in large numbers in the stool and can also be detected in the infected meat. *B. suipestifer* is rarely found in any of the domestic animals except pigs. Meat poisoning in man is often closely associated with "swine fever" in hogs and this disease or infection may occur as a secondary invasion.

Botulism, allantiasis, or sausage poisoning is an infection due to the *B. botulinus*, the result of eating decomposed pork or sausage, and is characterized by profound toxic symptoms of central origin, together with disturbances of gastric secretion. Intestinal colic, diarrhea, vomiting, vertigo, and extreme exhaustion are the usual symptoms.

The following cases reported by Boldman ("On Food Poisoning," Treat & Co., New York, 1909) are typical of this infection: "Three young men camping in California ate canned pork and beans. In eighteen hours they became ill and all died on the fourth day. Besides the usual symptoms of gastric irritation, confusion of vision was the earliest symptom, which was soon followed by aphonia, dysphagia, and distressing accumulation of mucus in the pharynx. Muscular power failed steadily, and breathing became difficult. The temperature was normal, or subnormal, constipation was stubborn, but there was a fair secretion of urine. To the last, the mental condition was notably clear."

In all cases of infection from *B. botulinus* central nervous symptoms or constitutional disturbances are always more marked than the gastroenteric symptoms.

Fish Poisoning

The flesh of certain fish, and at times oysters and especially the common mussel, has proved highly poisonous, producing violent and alarming symptoms. These cases were always very puzzling to the older toxicologists. For example, Christenson, in his work on poison, 1872, says, "The subject of fish poisoning is one of the most singular in the whole range of toxicology; and none is at present veiled in so great obscurity, nor can it be ascribed to any definite or rational cause."

The chemical ptomaines known as "neurine" and "muscarine" are now recognized as the high toxic element in decomposing meats and fish, while "mitolotoxine" is the name given the ptomaine or specific poison found at times in the mussel, and lastly, "tyrotoxon" is the toxic ptomaine found in cheese and ice cream.

Diagnosis

It is sometimes very difficult to distinguish between the various ptomaine poisonings and infections due to toxic microorganism, hence in all instances a careful bacteriologic examination should be made before infection by microorganism is excluded, and the diagnosis of ptomaine poisoning must always rest on the absence of other possible causes of the illness as well as the history and

clinical symptoms of the particular case. The bacilli, if responsible for the infection, can nearly always be isolated in large numbers from the stool of the patient during the actual illness.

A positive serum reaction can be anticipated in from two to six days after the onset of the illness. The bacilli can also usually be detected in the affected meat. Relative to the frequent mistakes made in the diagnosis of ptomaine poisoning, Richard Cabott facetiously remarks (*Journal American Medical Assn.*): "Ptomaine poisoning is one of the convenient, one of the most popular, and most fashionable diagnoses of the day among a certain class of practitioners. Yet this diagnosis will seldom stand criticism. Many of the cases to which this name is given turn out to be appendicitis, gallstones, intestinal obstruction, pancreatitis, a gastric crises in tabes, lead poisoning or other like diseases having nothing to do with ptomaine."

A diagnosis is often attended with difficulty and yet is of the greatest importance, as the successful treatment of a patient depends upon its accuracy.

TREATMENT

The treatment of poisoning from the ingestion of food products, whether it be the result of ptomaine or toxic microorganisms, is practically the same, and must remain so until the discovery and employment of the proper physiologic antitoxin. The treatment, therefore, is largely symptomatic, and as we have to deal with a toxemia due to the absorption of a powerful, rapidly diffusible toxin, every effort must be directed to promote elimination and prevent further absorption. In the milder type or less pronounced toxic cases, where digestion and gastric secretions cease, where the breath has a peculiar odor of fermentation, and where there is continued nausea and retching following gastric lavage, the author is accustomed to rely on calomel and bismuth (Calacetose) $\frac{1}{8}$ grain every hour or half hour, until two or three grains have been taken, when a laxative dose of magnesium sulphate (Merck) is given. Later tinct. nux vomica, 5- to 10-drop doses every three or four hours, serves as a most excellent tonic and restorative. In the more pronounced type, as indicated by a marked disturbance of the central nervous system, pallor, weak

rapid pulse, extreme thirst, disturbance of vision, and other symptoms of approaching collapse (with or without vomiting and diarrhea). Forchheimer recommends "thorough gastric lavage, following which the stomach should be washed out with a solution of sodium bicarbonate 1 dram to one pint, and lastly a solution of potassium permanganate, 1:1000, and before the removal of the stomach-tube calomel with a saline purgative should be given, and the action of these hastened by means of high enemata containing turpentine. Subcutaneous or intravenous salines should be exhibited freely. They have the double advantage of diluting the toxin, promoting elimination, and of relieving the intolerable thirst."

Blythe, in lieu of the permanganate, extols the action of tannic acid and suggests its employment in the following manner: "90 grains dissolved in $\frac{1}{2}$ ounce alcohol, to which is added one pint of hot water, is introduced through the tube, and immediately syphoned out, to be followed by a solution of tea, and the introduction of an ounce of castor oil."

Following gastric lavage, Adler recommends the administration of large and repeated doses of animal charcoal suspended in water. This he urges as a most useful measure to overcome the gastrointestinal irritation, in the presence of toxic substances or bacteria in the stomach and bowels.

Atropine, $\frac{1}{100}$ grain, should be administered hypodermically to relieve and control the pain and severe gastric symptoms. Liquor ammonium acetate in one- to three-dram doses to reduce febrile disturbances and relieve the kidneys, is also indicated; and later in the more pronounced or advanced cases of ptomainé poisoning, cacodylate of sodii 3 grains every four to six hours hypodermically has been suggested to prevent anemia and exhaustion, and direct transfusion of blood is said to have been followed with most excellent results. Cardiac and diffusible stimulants are likewise indispensable. Dietetic treatment is also of the greatest importance in the prolonged convalescence of these cases. The patients are at first fed on fresh fruit juices, preferably oranges; meat soups, or broths are given at frequent intervals; while fresh milk and all starches and sugars must be avoided.

Dilute nitric acid, 15 to 30 drops in half a glass of water, should be given three or four times a day on an empty stomach; and immediately after meals five to ten drops of tincture of nuxvomica should be given. When convalescence is assured, eggs, meat, fish, and vegetables are gradually added to the diet.

Ice Cream Poisoning (Galactotoxism)

Tyrotaxon, a violent irritant poison, is sometimes formed in milk or milk products, especially in ice cream, in the summer time. It is caused from milk decomposition and improper care or cleansing of milk cans. (See also Poisoning from Formaldehyde.)

SYMPTOMS

Severe gastroenteric disturbances, vomiting, purging, rigors, prostration, dizziness, offensive diarrhea, followed by muscular twitching, dilation of the pupils, and in serious cases of coma, with or without convulsions, and death. The symptoms in fact, closely resemble those of Asiatic cholera, for which it is sometimes mistaken. These symptoms follow at various intervals after the ingestion of the ice cream, and a series of cases as a result of partaking of the same product renders the diagnosis or source of the infection apparent.

A simple test for tyrotaxon is made as follows: Place on a porcelain slab two or three drops of a mixture of equal parts of sulphuric and carbolic acid, add a few drops of the suspected milk thinned with a little water and sulphuric ether. If tyrotaxon is present, a yellow to orange red color is produced. If no color occurs, the test is conclusive.

TREATMENT

No morphine or attempt to check the pain, vomiting or purging, should be permitted until the stomach is thoroughly washed out with a solution of bicarbonate of sodium, 1 dram to the pint, and the bowels emptied by a brisk purgative of at least 1 ounce of sulphate of magnesia, administered through the stomach tube. In other words, all the poison is first to be eliminated from the stomach and the intestinal tract before opiates are given. Cam-

phor in olive oil, $\frac{1}{2}$ to 1 grain, may be given hypodermically to sustain the heart, and normal salt solution should be introduced as high in the colon as possible to assist in eliminating the poison from the bowels.

After thorough vomiting and catharsis, morphine, $\frac{1}{6}$ to $\frac{1}{2}$ grain, may be given to control the pain and tenesmus. A mustard plaster placed over the entire abdomen is often of great benefit, and if prostration is marked, hypodermoclysis or normal salt solution (sodium chloride, 1 dram; sodium bicarbonate, 20 grains; brandy, $\frac{1}{2}$ ounce to the pint of sterile water) should be administered at a temperature of 105° ; to be repeated in 4 to 6 hours if needed. The stomach should be kept empty until vomiting ceases, after which a little brandy or black coffee will tend to relieve the thirst. Later, tonics and restoratives should be given as indicated.

Mushroom or Fungi Poisoning

The poisonous species of mushroom act frequently as narcotic poisons, and at other times as irritant poisons. Should the symptoms appear soon after eating, they are usually vertigo, drowsiness, dimness of sight, with marked debility. The person appears as though intoxicated, the pupils are dilated, and should spasms or convulsions occur, it usually indicates a fatal result. Frequently vomiting and purging precede the stupor. If the toxic symptoms are delayed, they are very apt to be of the irritant poison class, indicated by severe abdominal pain, retching and vomiting, with intense headache, marked depression of the respiratory and circulatory system. The body soon becomes cool, covered with a cold, clammy perspiration, with more or less delirium, and suppression of urine with albumin or jaundice may occur. The temperature is nearly always increased, the pulse rapid and thready. There are, however, a number of recorded cases where no toxic symptoms appear for from ten to thirty hours following their ingestion. The toxin is due to muscarine, which closely resembles pilocarpine in its action. It depresses the heart in overdoses, contracts the pupils, causes salivation, and the heart is arrested in diastole.

TREATMENT

Gastric lavage, with washing out of the stomach, and the administration of a large dose of castor oil or magnesia sulphate, should be given before removal of the tube. Atropine is considered the physiologic antidote, and should be freely employed in pronounced cases. To a strong person $\frac{1}{50}$ of a grain in solution should be given hypodermically, and repeated once or twice at intervals of two to four hours, until the pupils dilate. If the vomiting persists, or the diarrhea becomes too profuse and continuous, the sedative and soothing action of bismuth subnitrate should be utilized, and mucilaginous warm drinks should be given. The patient is likely to be thirsty and crave cold liquids, but it is better that he receive warm fluids. If the vomiting becomes serious, or the purging is not tractable, and especially if there is severe pain, a hypodermic injection of $\frac{1}{6}$ to $\frac{1}{4}$ grain of morphine should be given. The colon is then flushed with a purgative enema of 2 ounces of sulphate of magnesia; glycerin, 1 ounce; aqua 3 ounces; following the action of which, whisky should be given with a hot saline solution as high up in the colon as possible, and should be retained by pressure over the anus. When vomiting ceases, 10-drop doses of tincture of belladonna with brandy or whisky should be given by the mouth every three or four hours. The patient should be kept warm, and if collapse is profound or continuous, hypodermics of caffeine or sulphuric ether, hypodermoclysis and artificial respiration, with oxygen by means of the lungmotor, should be administered. Later, tonics and restoratives are called for.

Wild Parsnips

The root of wild parsnips, especially when grown on low, wet ground, is very poisonous, producing alarming symptoms, although rarely causing death. The symptoms produced by wild parsnip, pie plant, and other such poisonous vegetables, are classed as narcotic and irritants, causing irritation of the stomach and intestines, vomiting, purging, abdominal pain, cramps, tenesmus and strangury. The patient falls into a state of collapse, attended with drowsiness, accompanied by nervous twitchings or convulsion.

TREATMENT

Elimination by means of emetics of mustard and hot water, apomorphine, or gastric lavage, followed by brandy or whisky, or, in the absence of this, strong hot coffee should be repeatedly given as a stimulant. Morphine hypodermically to allay pain and purging, hot fomentation to the abdomen, and artificial heat to the extremities, are sometimes required, and if the cardiac depression is marked, adrenalin or camphor should be given hypodermically as indicated.

IVY POISONING

Synonyms.—*Rhus toxicodendron*; *Dermatitis venata*.

Some people are especially liable to poisoning by coming in contact with poison ivy, the characteristic symptoms being an acute dermatitis, with edema and hyperemia of the skin, closely resembling erysipelas. The irritation may be almost immediate, but generally develops in from six to eight hours following the exposure. The hands, forearms, face, and very frequently, the genitals, are favorite locations. Certain drugs occasionally produce this form of dermatitis; notably, iodine, arnica, antipyrin, and other coal tar products, blue ointment and other preparations of mercury, quinine, potassium bromide and antitoxin. In those particularly susceptible to ivy poisoning, there is always more or less swelling, with intense itching or burning of the affected regions, which soon become studded over with vesicles, blebs, or the cuticle may become denuded, leaving a raw, weeping surface. Constitutional disturbances are not infrequent. Headache, loss of appetite, exhaustion, and fever are common. Infection, manifested by edema, formation of pus, etc., is very rare from rhus poisoning, and more frequently follows nonsterile applications and improper treatment. Rhus poisoning is self-limited, and runs its normal course in from six to ten days.

Treatment

Soothing applications are most efficacious in subduing the inflammation. The author recommends as an application in the milder form of poisoning a 10 per cent solution of boric

acid, to which is added 10 drops to the ounce of a 50 per cent solution of carbolic acid and glycerin, which may be kept continuously applied on soft linen cloths or gauze. In the more aggravated form, of the many remedies suggested—and they seem to be innumerable—may be mentioned: Cocaine, 5 per cent solution, applied locally, which is probably the most efficient remedy we have to relieve the burning and itching in acute cases. Solutions of Grindelia have proved disappointing to the author. A hypersaturated aqueous solution of sodium sulphate, applied freely and continuously, is regarded as specific by many authors. Ichthyol in the form of a 10 per cent ointment is very soothing and curative, but it is questionable as to whether or not any of the more modern remedies surpass in efficiency the lead and opium wash of our ancestors, the formula for which is as follows:

℞ Liq. Plumbi subacetatis dil.	℥ i
Tr. opii	℥ ii
Aqua dist. ad.	℥ xvi
M. ft. lotio.	

which should be continuously used until all local signs of the inflammation subside, after which the affected area may be covered two or three times daily with an ointment of calamine, 1 dram to the ounce, or oxide of zinc ointment, prepared with a petroleum base. Chlorazene cream is one of the highly extolled recent remedies applicable for ivy poisoning.

Internally, quinine sulphate in 5-grain doses three or four times a day, has proved of material value. Opiates are required to allay pain and produce sleep in pronounced cases, and Fowler's solution may also be of benefit as a tonic and restorative.

POWDER BURNS OR STAINS

Powder burns upon the face or exposed parts must be carefully treated to prevent powder stains or marks. Usually powder burns are superficial and vigorous scrubbing with a stiff brush and green soap will be sufficient to remove the powder and stains.

If the burns of the face are extensive and painful, and the marks of the powder stain liable to be extensive, an anesthetic should be given in order that the scrubbing and cleansing may be carried out extensively. After the scrubbing, a strong solution

of peroxide of hydrogen as recommended by Crile, should be applied, as it tends to displace the grains of powder and facilitates their removal. Much can be done by picking out the grains of powder by means of a small spud, surgical needle, Stelwagon's cutaneous punch, or Watson's discotome. In the absence of these, Politzer's set of ear eurettes and operating instruments can be em-



Fig. 89.—Poltzer's ear operating instruments.

ployed to great advantage. The punch or eurette is placed over the powder speck or grain, pressed firmly with a slight rotary motion to the necessary depth, and the little bit of skin containing the stain is elevated and snipped off. These minute sears disappear after a few weeks. The ordinary dressings may then be applied to the parts after applying oxide of zinc ointment or a paste of tincture of benzoin with boric acid.

BURNS AND SCALDS FROM FIRE, GASOLINE, KEROSENE, STEAM, OR BOILING WATER

Burns and scalds are probably the most common of all accidents.

Treatment

Light, fluffy, sterile gauze dressing gently applied and kept in place with a light gauze roller bandage without pressure, is the best possible dressing for burns and scalds of whatever nature



Fig. 90.—Extensive scalds from bursting of steam pipe (before treatment).

or degree. Cotton should never be used, as it not only prevents evaporation, but retains the heat and is sticky and very difficult to remove when required.

For ordinary burns and scalds a saturated solution of sodium bicarbonate (common baking soda) kept constantly applied is an excellent remedy for the relief of pain, or "to draw out the fire." After two or three hours, picric acid may be substituted



Fig. 91.—Serious burns from gasoline, following explosion of stove (before treatment).

for the soda solution as a simple and satisfactory remedy for all ordinary burns and scalds. A solution is made by dissolving $1\frac{1}{2}$ drams of picric acid in 3 ounces of alcohol, permitting the acid to dissolve, and then adding one quart of distilled or sterilized soft water.

The burned or scalded surfaces are carefully cleansed with small pieces of sterile, absorbent cotton dipped in a solution of picric

acid. Blisters are pricked with a sterile needle, but care should be taken not to tear or remove the raised skin. Strips of sterile gauze soaked in the picric acid solution are applied so as to cover the entire scalded or burned surface, and the whole kept in place with a light gauze bandage. The dressing soon becomes dry, and if the patient suffers much pain the dressing may be moistened without removal by pouring on more of the solution. The first

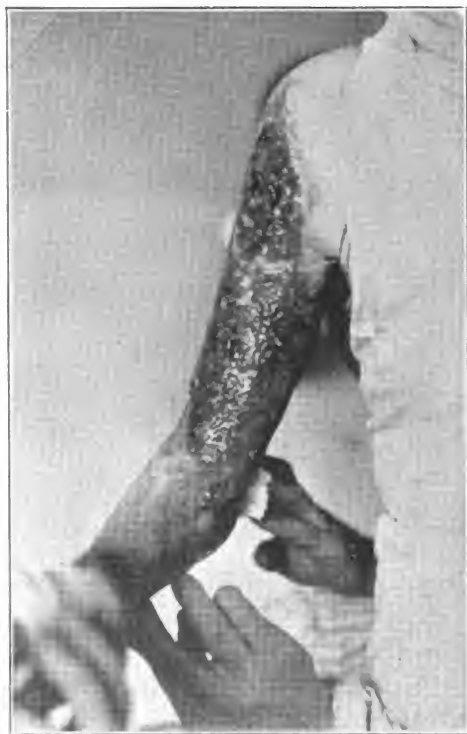


Fig. 92.—Extensive scald from steam.

gauze dressing should be left in place three or four days and then removed, after being saturated again with the picric acid solution.

If at this time the skin shows evidence of inflammation, or sloughing, the strength of the picric acid solution should be increased one-half or one-third to the quart of water in order to relieve the pain and limit the tendency to suppuration.

In the more extensive scalds and burns where a large portion of

the body is involved, the author, having tried many of the popular remedies, returns to the old-fashioned carron oil. This should be freshly prepared and is made by mixing equal parts of unfiltered limewater with freshly boiled or sterilized raw linseed oil, to which has been added 1 ounce of calenduline to 1-pint of the mixture. This must be kept constantly applied on sterile gauze and may be used freely without fear of toxic effects. The first dressing, saturated and carefully applied, should not be removed for four or five days, but kept constantly moistened with the oil. After the fourth day fresh sterile dressing may be applied and the same treatment continued for three or four days more, after which, should there be indications of ulceration or sloughing, strict antisepsis and cleanliness must be rigidly enforced.

Little balls or wads of sterile absorbent cotton soaked in sterilized pure olive oil is very soothing and should be used in cleansing or removing crusts from the isolated patches, or circumscribed areas of sloughing. The dressing should be changed two or three times daily. The author at this time prefers to use an ointment of orthoform, 10 per cent to the ounce of sterile cosmoline, or thymol, 3 grains to the ounce of ungt., oxide of zinc with petroleum base, spread on sterile gauze, or either of the following:

(a) Alexander's paste, made by rubbing 1 dram of ichthyol with 3 drams of olive oil and incorporating the mixture with enough lanolin to make 4 ounces.

(b) Sterilized oxide of zinc ointment with petroleum base with which has been incorporated $\frac{1}{2}$ ounce fluid extract of calenduline to every 4 ounces, makes a very pleasant and efficient ointment.

In very extensive burns or scalds, during the first 24 or 48 hours, hypodermic injections of morphine, $\frac{1}{4}$ to $\frac{1}{2}$ grain, given with 30 minims of camphor water, repeated as required, should be administered to relieve pain and stimulate the heart. Continuous proctoclysis is also essential to overcome exhaustion and severe shock and also to relieve the intense thirst. Supportive treatment is also called for, and every possible effort should be made to maintain the strength of the patient.

PARAFFIN METHOD OF TREATING BURNS

The paraffin method of treating burns and scalds introduced by a French physician under the proprietary name of "Ambrine" has proved of great advantage despite the fact it was not at first kindly received by the medical profession. Ambrine, as first introduced, was composed of specially prepared paraffin wax into which was incorporated 5 per cent of oleum succini (amber). The original method consisted in applying the ambrine at the first dressing, but if sepsis was present, hot boric solution or fomentations were employed continuously for three or four days, after which the burned or scalded area was cleansed with sterile water dried



Fig. 93. —Freshly burned area.

with sterile gauze or a special electric drying apparatus after which by means of a soft camel's-hair brush, a coating of the ambrine was applied over the entire surface at a temperature of 122° F., and over this a thin layer of cotton wool and a second coating of the wax.

The practical results were apparently so beneficial and soothing to the patients that surgeons of large experience have become very enthusiastic over the remarkable facility with which extensive burns heal under this form of treatment, and its universal adoption is now assured. The essential feature of paraffin treatment consists of the employment of wax of a low melting point, which, when applied hot, will set immediately and form a coating which will remain pliable and coherent and adjust itself without

breaking. The wax shell should not adhere to the new skin or granulations, but may be removed painlessly when necessary to cleanse the surface of the wound. It is very important when application by the brush method is made that the paraffin should be carefully melted and kept at the proper temperature. This is best accomplished by means of a small "double boiler" or oatmeal cooker the water in which should be kept at the boiling point for a few minutes or until all the wax is melted. Care must also be taken to prevent splashing of the boiling water into the melted paraffin since its presence causes intense pain when applied to burns. Several authorities insist that the paraffin should be applied at a temperature of 130° to 150° F. The burned area seems to be far less sensitive than the skin. In the experience of the author in civil practice, especially in children and delicate-skinned patients, unless applied under anesthesia, a temperature of 118° to 120° F. is preferable and less painful. The following formula for the preparation of paraffin wax has been recommended by Dr. A. J. Hull of the British Army. It is known as formula No. 7:

R Resorcin	1 per cent
Eucalyptus oil	2 per cent
Olive oil	5 per cent
Paraffin, soft	25 per cent
Paraffin, hard	67 per cent

Melt the hard paraffin and add the soft paraffin and olive oil. Dissolve the resorcin in absolute alcohol; add the alcoholic resorcin and lastly the eucalyptus oil when the wax has been cooled to about 130° F.

Dr. Haworth,* of the Western Pennsylvania Hospital, Pittsburgh, recommends the following:

In the preparation of "West Penn Wax," the ingredients are mixed in these proportions:

R Paraffin	70.0 gm.
Liquid petrolatum	3.0 c.e.
White beeswax	10.0 gm.
Rosin	7.0 gm.
Resorcin	0.2 gm.
Sudan III (Stain)	0.05 gm.
Alcohol (95 per cent)	10.0 c.e.

The paraffin and the oil are melted in a casserole over asbestos

*Jour. Am. Med. Assn., May 12, 1917.

board, the direct fire being used. The resorcin is dissolved in the alcohol, and added drop by drop to the molten paraffin with constant stirring. The mixture is now heated until all the alcohol is evaporated. The beeswax is stirred in until melted, heat being used if necessary. Then the rosin is added and mixed in thoroughly while the casserole is being heated. The mixture can be poured into molds and cooled. The West Penn wax is very flexible. On cooling it contracts and exerts a suction action, thus inducing an active hyperemia and keeping the wound air-tight.



Fig. 94.—Douching the burn with Dakin's solution.



Fig. 95.—Drying the wound with the electric hot-air drier.

The resorcin is added as a mild antiseptic and as a preventive of foul odors that might otherwise be formed. Sudan III is used as a stimulant of epithelialization. Scarlet red may be used instead. Under the name of "Redintol," Johnson & Johnson have prepared a mixture of paraffin and resins to take the place of the French preparation and it is now supplied to the profession in the form of a solid brown wax-like cake. The Abbott Laboratories have also placed on the market a paraffin preparation called

“Parresine” and for convenience in carrying in emergency cases is supplied in one-half and pound sterile packages.

Improved Technic

The burned area should be carefully but very gently cleansed by douching the parts with a comfortably hot 1 per cent Dakin

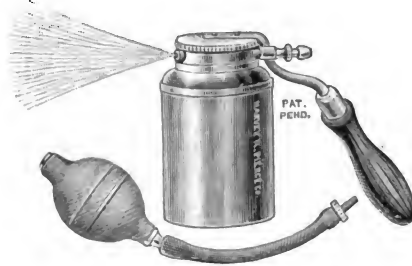


Fig. 96.—Paraffin atomizer.

solution. Blisters or necrotic tissues should not be disturbed; blisters, if very large, may be partially emptied by needle puncture. Before applying the paraffin, the injured area must be

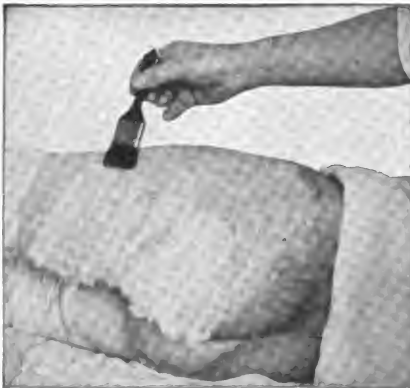


Fig. 97.—Application of paraffin with brush.



Fig. 98.—Final dressing.

carefully dried by gently touching with sterile gauze or preferably with the electric hot-air drier which causes no pain.

When dry, the burned surfaces should be coated over with the paraffin. This is best performed with the paraffin atomizer by

means of which a fine spray of the melted paraffin can be deposited rapidly and evenly to all parts of the burned surface. (An atomizer prepared for this special purpose consists of a metal cylinder to hold the paraffin, surrounded by a large air- and water-tight jacket which is filled with hot water. By means of this apparatus the melted paraffin is kept liquid and at an even temperature.) When the atomizer is not available, a fine soft camel's-hair varnish brush may be used. The brush is dipped into the melted wax and applied with the utmost gentleness, not only to avoid unnecessary pain, but to cover all parts definitely and smoothly. As soon as this first coating has solidified, a thin layer of absorbent cotton is placed over the part and a second paraffin coating applied over and beyond the unburned edges of the skin to seal and protect the parts from access of air. A second layer of cotton followed by a heavier coating of paraffin is usually desirable. The paraffin shell completed and sufficiently dry, the parts are finally covered with sterile gauze and held by a proper bandage. The burns are dressed daily for the first week, after which, if the burn is clean and free from pus, the dressings are allowed to remain from 48 to 60 hours. (See also Treatment of Burns with Dichloramine-T.)

ISOLATION, OR THERMIC, FEVER

Sunstroke—Heat Stroke—Heat Exhaustion.—The condition of the body resulting from exposure to high atmospheric temperature, with excessive humidity, or moisture. These factors seem to be the most important, while the use of alcoholic beverages also tends to be a predisposing factor.

It is not necessary to be exposed directly to the sun's rays, as the conditions prevail in large cities among bakers, stokers, firemen and iron foundrymen. Overwork, overeating, debility from any cause, and the lack of abundant water for drinking and bathing, loss of sleep and a torpid condition of the bowels, are regarded as contributory to heat stroke. French clinicians assert that heat stroke is a form of infection or autointoxication from bacterial or chemical changes, due to waste products detained in the

blood, the exact nature of which is not easy to define with our present knowledge; but the evidence is positive that the serum, perspiration and urine of patients dying from heat stroke are highly toxic to animals.

Symptoms

Although not referred to in textbooks, the author has noted a number of instances where there was apparently a period of prodrome of three or four days following undue exposure or exhaustive work under atmospheric conditions conducive to heat stroke. The patient complains of marked depression, headache, vertigo, with more or less nausea, with only a slight variation of temperature, which was followed suddenly by the most pronounced symptoms. The more severe type of cases as a rule begin suddenly. There is usually intense frontal headache, with vertigo, blindness, and vomiting. Sudden unconsciousness develops, ushered in by violent convulsions. Again, the patients pass, without a convulsion, into a state of profound coma, with stertorous breathing and marked cyanosis. The temperature develops rapidly and is characteristic of this disease, as it surpasses in height that of any other affliction; 105° , 110° , to even 115° is not uncommon. The pulse is full and bounding, 130 to 140 a minute. The muscles are rigid, and the pupils may be either fully dilated or finely contracted. If the fever can not be promptly reduced and controlled, cardiac and pulmonary congestion soon ensues, causing death in from twelve to twenty-four hours.

Prognosis and Sequelæ

The height and resistance of the fever governs the prognosis. Alcoholics, even if robust in appearance, are notoriously poor subjects, and like the aged, possess little resistive powers, and succumb easily. Secondary meningitis may follow apparent recovery, and dementia and other forms of insanity often result from the effects of a heat stroke. Patients, even after a mild attack, are unable for a long time to resume any business requiring much mental activity, and persons who recover are far more susceptible to heat or high temperature in after years.

Diagnosis

Apoplexy and uremic coma are the only two conditions that in any way resemble the unconscious condition resulting from heat stroke. In apoplexy there are local symptoms of paralysis, atheromatous conditions of the arterias and *absence of high temperature*. In uremic coma there is albuminous urine and evidences of edema of the feet and legs, and the temperature is normal or seldom very high. A temperature of 106° or 108° following exposure to heat would render the diagnosis most positive.

Treatment

W. D. Burg* in a careful study of the symptoms and effect of 158 cases of heat prostration, concludes as follows: "A careful study of these cases shows that they fall into three distinct types: First, heat exhaustion; second, heat prostration; and, third, heat stroke. Pathologically the three factors may not be so definite, but from the bedside and therapeutic standpoints this grouping would seem to be almost unavoidable.

"1. Heat Exhaustion.—These patients commonly present a moist, cool skin, with subnormal temperature, occasionally as low as 95 or 96 degrees. The pulse is small and rapid and the patient is very pale and prostrated, and usually unconscious. The patient having been subjected to long-continued high temperature, not necessarily in the sun, combined with physical exertion, was evidently the cause of prostration.

"The treatment of these cases was as follows: Dry rubbing, blankets, sometimes artificial heat, ice bag to the head, and stimulants according to the individual case. Whisky, aromatic spirits of ammonia, caffeine, and strychnine, and occasionally adrenalin were used. [Burg suggests that in this type adrenalin seemed the stimulant whose physiologic action was just what was needed.]

"2. Heat Exhaustion.—These cases comprise the largest number in the series, and have the lowest mortality record. These patients had temperatures varying from normal to 102° and 105°. Many felt dizzy, nauseated, and complained of headache. A few lost consciousness, the coma being very similar to that of

*Burg: Boston Med. and Surg. Jour., 1911.

simple syncope and lasting for a short time only, while all felt much prostrated. Many of these patients had normal temperature, while those with fever had moist skin, and there was an absence of cyanosis or lividity. The circulatory condition of this type was generally good, only moderate stimulation being used on 30 out of the 87 patients.

"The treatment was as follows: Ice cap, ice pack, cold pack, or sponge bath, according to the temperature, and rest in bed and moderate stimulation as before described, if there were signs of weakness.

"3. Heat Stroke.—These were by far the most serious and impressive of the cases. There were 61 of these patients with a mortality of 38. The patients were unconscious, livid and cyanotic, with hot, dry skin and temperatures ranging from 104° to 110°. Many axillary tests registered 112 degrees. The most serious of these cases were breathing stertorously, frothy at the mouth, and some vomiting large quantities of dark semifluid material, almost fecal in character. This type all showed venous engorgement, with visible carotid pulsation in the sides of the neck, and full, bounding pulse, except in the moribund cases, where the heart was giving out. The pupils were generally small, often pinpoint, and reacted to light. Knee reflexes were absent and a large majority showed considerable muscular rigidity.

"These cases were treated as follows: Here there are four indications: (a) reduction of temperature; (b) maintenance of cardiac action; (c) control of convulsions; (d) treatment of complications.

"(a) Tub baths and ice packs were the choice in combating the high temperature. If the heart action was poor, the ice pack was always used to avoid moving the patient. Vigorous friction seemed essential to good results. Also, not a few cases were observed where too long continuance caused too great a reduction of temperature, and a condition of collapse was induced. Ice water enemas were used in a few instances, but as a rule a proper use of external measures seemed sufficient.

"(b) Maintenance of cardiac action often required stimulation of a heroic type, mostly hypodermically, as the patients were generally unconscious. Generous use of atropin was practiced for pulmonary edema, and strychnine, camphor, and various

forms of shock enemas were directed at the failing heart. It was the general opinion among the house staff that the use of camphor, 2 grains in sterile oil by syringe, was of distinct value.

“(c) Convulsions were so frequent in the heat stroke cases that it became the practice towards the end of the so-called epidemic to administer morphine subcutaneously, and sometimes hyoscine, with the plan of repeating the morphine if the convulsions nevertheless developed.

“(d) The treatment of complications as they occurred varied in no way from that which would be adopted in cases in which they were the primary disease. About five of the unconscious men required catheterization for retention of urine.”

Summary of Treatment

All emergency cases require prompt and vigorous treatment. The patient should be stripped and placed on a canvas cot, over which has been put a rubber blanket. The temperature must be reduced, and wherever possible ice water or ice itself must be used. A spray nozzle attached to a garden hose or a sprinkling waterpot filled with ice water is an excellent method, and at the same time the patient must be vigorously rubbed by one or more attendants to draw the blood to the surface and prevent internal congestion. When by these means the temperature falls to 102°, the cold applications should cease for a time at least, owing to the liability of producing collapse and subnormal temperature.

If the patient is robust and cyanosis is marked, venesection should be employed not only for temporary relief, but to prevent meningeal or cerebral congestion. Twelve to 16 ounces are often required. Any subsequent rise in temperature must be controlled by the same methods. Artificial respiration is often necessary and should be persisted in. Hypodermics of adrenalin, atropine, or camphor should be early resorted to with morphine, and hyoscine to control the delirium, while a purgative enema may also prove of material benefit. The patient should be catheterized early. The after-treatment consists in keeping the patient quiet in a recumbent position for several days, and the administration of tonics and restoratives as indicated.

TRICHINIASIS—TRICHINOSIS

An infection resulting in man from eating partially cooked or raw ham, bacon or pork, containing the larvæ of *trichina spiralis*.

Symptoms

Trichiniasis presents itself in three stages: the intestinal, migratory and encapsulatory. In from two to three days following the ingestion of the parasite, marked symptoms of gastrointestinal irritation supervene, nausea and vomiting, intestinal pain, and diarrhea in proportion to the number of the parasites present. This stage of the disease is soon followed by symptoms closely resembling muscular rheumatism, the fever assumes the typhoid type, headache, thirst, abdominal distention, with marked prostration and rapid emaciation. The skin about the eyelids becomes edematous and the face red and swollen. The muscular movements are always painful on motion and sore to the touch. "When the muscles of the diaphragm become involved, there is marked dyspnea and cyanosis." (Thompson.) "Marked leucocytosis develops with increase of the eosinophils and their greatest development seems to occur about the time the embryonal trichinæ are passing from the intestines by way of the lymphatics and blood to the muscular tissues; that is, during the third week following the ingestion of the trichinous meat." (Hare.)

Diagnosis

The diagnosis is based upon the severity of the gastric symptoms, which do not readily respond to ordinary treatment. Hare advises in suspected cases a microscopic examination of the stools of the patient. "A portion of which placed and flattened to a thin layer between two sheets of glass resting on a dark background and then examined by means of a hand magnifying glass, when the parasites may be found as small, short, glistening, thread-like bodies." The most positive way of determining the presence of trichinæ is to incise a small portion of the infected muscle, which can be accomplished under local anesthesia, and if embryos are present, they can readily be seen. After three or four weeks, should the patient survive, the trichinæ become encapsulated, and the patient may slowly recover.

The mortality varies in accordance with the severity of the attack from 40 to 70 per cent.

Treatment

If the patient is seen soon after partaking of the diseased meat, or if the diagnosis can be established prior to the migration of the trichinæ into the tissues, a brisk purgative of turpentine, 1 dram, castor oil, 1 ounce, may be given with marked abortive effect. Otherwise, the treatment must be wholly symptomatic, morphine to control the pain, general tonics to sustain the strength, and nutritive diet, being the essential features. The author has used in one case with apparent benefit, cacodylate of sodium hypodermically, every four hours for six doses. Salvarsan has been suggested as specific, but the employment of this class of remedies is wholly empirical and has not as yet received the endorsement of the profession.

RABIES—HYDROPHOBIA

Hydrophobia is an acute infectious disease or terminal stage of an infection by a specific virus. It is communicated only by the bite of a rabid animal. Rabies in man is contracted in nearly all cases from dog bites, but cases are sometimes reported from the bite of a cat, skunk, wolf, or other wild animals. All warm-blooded animals are liable to this disease, but especially cattle and sheep. It is rare in the horse and in swine.

Period of Incubation

The period of incubation in true rabies varies from 30 to 90 days, although cases are reported occurring a year or more after the injury. According to Bradford and other experts, it is rare after three months, and a six months' incubation is extremely rare.

Symptoms

The premonitory symptoms are usually the same as those of typhoid and other infectious fevers. Headache, irritability, general malaise, insomnia, loss of appetite and thirst. There may be

a slight fever, the tongue is usually coated, and breath is foul. The wound or bite usually heals promptly, but may be the seat of darting pain, or become slightly inflamed. If the patient attributes his affliction to the bite or wound, it adds to his anxiety, makes him fretful or very nervous, and may lead to a condition of melancholia.

The second stage or period of excitement is usually manifest by difficulty in swallowing, with a stiffness of the muscles of the neck and difficulty of breathing. Attempts to relieve his thirst cause spasms of the glottis, throat, and muscles of the jaws. Delirium and convulsions now ensue. The delirium may become maniacal in character, and the sounds emitted with respiratory efforts, are supposed at times to resemble the barking of a dog. They are really more of a croupy sound. The pulse is feeble and rapid, and the patient when conscious expresses dread of death, etc.

The temperature is usually but slightly elevated, not exceeding 100° to 102° , and more often it is subnormal the last twenty-four or forty-eight hours preceding death. Should the patient survive the attacks of convulsion, they pass into what is termed a third stage, or state of paralysis. The patient may be able to swallow and apparently seems better. The muscular spasms are now very light, or absent. The paralysis begins in the lower extremities and gradually ascends, involving the muscles of the abdomen, chest, upper extremities, and lastly the brain; death resulting from paralysis of the respiratory centers. The third stage rarely lasts to exceed twenty-four hours.

Diagnosis

True hydrophobia, or rabies, must be distinguished from the condition known as pseudohydrophobia, which occurs in those bitten by a nonrabid dog. Pseudohydrophobia or lyssophobia, is a hysteric condition which may be so exaggerated as to resemble closely the true form. The symptoms come on suddenly, the patient may bark like a dog, tries to bite others, froths at the mouth, and becomes maniacal, so much so as to require restraint by artificial means. The pulse is usually normal, there is no fever, and the disease yields to antihysteric treatment. "Should the disease occur but a few days after the bite or injury, and if the

acute symptoms persist for a week or more, or if the patient recovers, the proof that rabies does not exist is positive." (Keen.)

Treatment

As in tetanus, when the acute symptoms are manifest, medical treatment is of little avail. Wounds of the face and scalp are far more readily followed by rabies than bites in other portions of the body, especially in the extremities. The prophylactic treatment is now placed on a scientific basis, and the disease is now almost always aborted, or prevented.

As in tetanus, if an extremity is bitten, a ligature should be placed immediately above the wound. The wound and all recesses must be carefully and surgically cleansed, washing and scrubbing of the part, followed by a solution of hydrogen peroxide, 3 per cent, introduced under pressure, and this followed by the application of a 5 per cent solution of permanganate of potash, and after drying the part, the wound must be cauterized by means of fuming nitric acid, applied most thoroughly. Some authors prefer nitrate of silver, used in stick form, since the acid causes at times considerable sloughing. Gower states that "It is doubtful whether the disease ever occurred, if after thorough cleansing, a stick of nitrate of silver is immediately plunged into the wound."

After cauterization, the wound is carefully dressed and the Pasteur treatment should then be commenced, for as Sajous truly says, "it is upon the efficiency of preventative measures the life of the patient must depend."

PASTEUR'S PREVENTIVE TREATMENT

In 1885 Pasteur produced a vaccine which is now regarded as a positive preventive of rabies. Pasteur institutes were established in various large cities, where all suspected cases were taken for treatment. Very recently the M. K. Mulford Company of Philadelphia has introduced a method of supplying the vaccine which renders it possible to be sent safely through the mails, and it can be easily administered at the home of the patient by the attending physician. The sealed ampules are shipped in caloric bottles and arranged to be shipped daily, with full and complete directions for its administration.

Koch concludes his review of the fifteen years of work in the rabies department of the Institute for Infectious Diseases at Berlin, with the statement that potassium iodide is of great use in the prophylactic treatment of rabies. He refers especially to the cases in which the virus has lurked silently in the body for weeks, months, or years, and finally rouses to bring on the rabies in a pronounced form. Nothing is known that will neutralize the rabies virus, but he thinks that potassium iodide may influence the tissues of the central nervous system so that they will no longer have an affinity for the virus. Every person taking the Pasteur treatment is given a tablespoonful of a one per cent aqua solution of potassium iodide, and then takes three or four bottles during the course of the hospital treatment. This is continued after the Pasteur treatment for a year. He warns in regard to the influence of a trauma, overfatigue, emotional stress, or abuse of alcohol, in arousing the slumbering virus to bring on the disease. Koch believes it has been established beyond question that the virus can be present in the nerve tissue without causing any manifestations until something occurs to arouse it to malignant action.

TETANUS

Tetanus is an infectious disease due to a specific bacillus, the toxin of which, according to Gumprecht, attacks the spinal cord and not the peripheral nerves, and all clinical symptoms characterized by both tonic and clonic contraction of the muscles of the jaw and voluntary muscles of the entire body, are the direct results of the action of the toxins upon the cord alone. Tetanus may be classed as idiopathic and traumatic. By far the greater number of cases are due to trauma from punctured wounds by rusty nails, pins, splinters, pitchforks, or from lacerated wounds such as gunshot, pistol shot, powder burns, firecracker injuries, toy pistol accidents, barbed wire, etc., and in open or compound fractures. Idiopathic tetanus may develop without any sign or history of injury. It has occurred in epidemic form among children in maternity hospitals. The germ is supposed to be inhaled with dust, or taken into the stomach in contaminated vegetables, and occurs in the newborn. The bacilli enter through the umbilical cord (tetanus neonatorum).

Symptoms

The symptoms known as tetanus usually make their appearance from a few hours to two or three or four weeks after the introduction of the bacilli into the tissues. The attacks are usually preceded by a chilly sensation or feeling of great lassitude, and in traumatic cases the tissues around the wound become more or less painful or sore. The attack is manifested by marked rigidity or spasm of the muscles of the jaw and neck. The patient finds it difficult to swallow, and can not open his mouth. This rigidity of the muscles soon extends over and invades the whole body, abdomen, and legs. The patient's head may be drawn forcibly backwards or rigidly to one side. The features may be frightfully distorted by irregular contractions of the facial muscles, and the angles of the mouth may be so elevated as to cause a peculiar grin (*risus sardonicus*). The spasms or paroxysms occur intermittently, and do not, as a rule, last but a few minutes except in very marked cases. At first the spasms may not be painful, but as they become more and more severe, the patient complains of excruciating pains and perspires freely. Should the muscles of the diaphragm and chest become seriously involved, death may result from asphyxia.

Ordinarily there is little fever, but a temperature of 102° to 103° is not uncommon, and as death approaches, the fever may rise to 108° or 110° . The blood pressure is always elevated, and may be so great as to cause capillary hemorrhage, with possible infiltration and miliary hemorrhage of the spinal cord. Very frequently the wound or primary injury is apparently slight, and may have healed before symptoms of tetanus appear, hence all such injuries should be carefully sought, since symptoms developing as the result of an injury after three or four weeks, no matter how slight the wound, may tend to confirm the diagnosis of tetanus.

Diagnosis

The symptoms of tetanus are usually so marked that an error in diagnosis seems almost impossible. Spasms due to poisoning by strychnine may closely resemble those of tetanus, but the symptoms appear more rapidly, and the muscles of the face are not so much involved as those of the trunk and legs, and there is

usually some evidence of the taking of the poison. Convulsions due to cerebrospinal meningitis may simulate tetanus, but the cerebral symptoms predominate and are so plain as to distinguish the difference. Lastly, the bacterial examination will remove all doubt as to tetanus.

Duration of Disease

The majority of fatal cases die before the fifth day, and should the patient survive ten or twelve days the chances of recovery are greatly increased.

Prophylactic Treatment

Notwithstanding the discovery of antitetanic serum, its employment during the attack has not materially decreased the mortality in tetanus, owing possibly to the method and quantity given. It is useless to give small quantities subcutaneously, and also a grave mistake to withhold the administration of the antitoxin even for a few hours in order to establish the diagnosis. For prophylactic purposes, 1500 units is considered sufficient, and the prompt injection intravenously of 10,000 to 30,000 units immediately upon observation of the first tetanic manifestation may be instrumental in saving a life which would otherwise be lost. Surgical prophylactic measures are likewise of the utmost importance. All punctured or lacerated wounds, however insignificant, should be carefully rendered as nearly aseptic as possible. Tincture of iodine should be applied for a sufficient area around, but not in, the wound. Anesthesia may be necessary, for the wounds must be freely incised and all local detritus, foreign substance, and torn tissue, removed, and the parts exposed to view. Cauterizing the wound is now generally abandoned, as the eschars tend to seal the wound and provide the tetanus bacilli with the proper environment for propagation. Oxygen is supposedly the best application to destroy the bacillus, hence, a fresh solution of not less than 3 per cent hydrogen peroxide should be forcibly injected into every recess of the wound, and after careful and thorough disinfection, the wound should be covered with a thick layer of antitetanus serum, and the wound left open or lightly packed with iodoform gauze to secure good drainage. The

local use of powdered dry serum is highly extolled by Letulle and others, as a preventive measure to all open wounds and abraded surfaces, likewise in all cases of open or compound fractures. Where there is any question of liability to infection, the patient should receive the benefit of the doubt and the antitoxin should be administered.

When the wounds are properly dressed, 1500 units of the American antitetanic serum should be injected into a vein and repeated daily for two or three days. Internally the administration of potassium iodine three times daily to an adult may be employed to advantage as a prophylactic measure.

Treatment of Developed Tetanus

Once established, according to a number of experienced experts, antitetanic serum does not seem to lessen the lethal tendency of the toxin. Of the various methods of administration of the serum—intravenous, subcutaneous, intracerebral and sub-arachnoid—the intravenous method seems to be the most effectual and least harmful. In the constitutional treatment there are three indications that demand attention: first, to prevent further absorption of the toxin, or destruction of the bacilli; second, elimination of the toxin; and third, to counteract the effects of the toxin.

Relative to prevention of further absorption, we have antitoxin, carbolic acid, magnesium sulphate, and brain emulsion. "Not less than 10,000 to 30,000 units should be injected, preferably into the median basilic vein near the elbow, and in order to sustain the action, repeated every three or four hours, with the simultaneous internal administration of thyroid extract in full doses of 5 to 10 grains, should the temperature remain low. If the temperature of the body rises materially, the use of the thyroid must be discontinued." (Sajous.)

Carbolic acid is considered by many superior to the serum in developed tetanus. It should be used with caution, however, and is best employed in a three to five per cent solution, given hypodermically in ten- to fifteen-drop doses every two or three hours. Creasote, 20 minims dissolved in 1 gram of sterilized olive oil, may be given hypodermically should the symptoms persevere after using antitoxin and carbolic acid.

The subdural injection in the lumbar region of $1\frac{1}{2}$ to 2 dram doses to an adult of an aqueous solution of magnesium sulphate, according to Blake, is "reasonable, safe, and offers us a means of modifying the convulsions and relieving pain in a way no other drug has approached." It may be repeated in four to six hours.

Brain emulsion as recommended by Krotieweiz may sometimes be employed to great advantage. The brain of a sheep, rabbit or dog freshly killed, is made into an emulsion with one to two ounces of sterile salt solution, and injected subcutaneously in the neighborhood of the wound, if possible, and repeated every six hours.

The second indication for treatment—elimination—is best accomplished by the establishment of diuresis. Hot water baths and slightly alkaline water should be given freely as a drink to the patient. Saline enemas or the intravenous injection of Matthew's salt solution given slowly by the drop method, increases greatly the action of the kidneys, thus carrying off the toxin. The formula for Matthew's solution is as follows:

R	Sodium chloride	gr. lvss
	Sodium sulphate	3 iiss
	Sodium citrate	gr. li
	Calcium chloride	gr. ii
	Aqua	O. ii
	M.	

The third indication, is to counteract the effect of the toxin upon the nervous system.

Chloral hydrate is considered the best physiologic antidote. Fifteen grains given alone or in combination with potassium bromide, 15 to 30 grains, every four to six hours, may be given to control the convulsions. Morphine sulphate with or without atropine is usually indispensable. Physostigma, or calabar bean, has been employed by some, but a strictly pure drug is difficult to obtain, hence its employment is questionable. Inhalations of amyl nitrate are of special benefit when asphyxia seems imminent.

Chloroform during the severe convulsions may be employed, but is considered by some authors detrimental, hence its use should not be prolonged.

The diet is of importance. All animal meats, broths, extracts, etc., should be withdrawn entirely, and the patient nourished with cereals or vegetable soup, or milk may be administered at regular intervals. It is often necessary to feed the patient by means of a tube through the nose or mouth. A brisk saline laxative may prove of material benefit at any time during the course of the disease, if indicated.

Prof. Wm. Hesser,* relative to the treatment of tetanus, concludes as follows:

"1. General and medical treatment. Along with the antitoxin and magnesium sulphate, we must employ every available agent that may be of service. Of the most importance are quiet, hygienic surroundings, and good nursing; plenty of easily digested food, and much water should be given. Attention to bowels is essential and proctoclysis is of the greatest benefit. The usual sedatives may be given by mouth or rectum, and heart and respiratory stimulation reserved for the emergency.

"2. Prophylactic injections of antitetanic serum in cases of suspicious wounds are unquestionably of great value in preventing the development of tetanus.

"3. After the onset of the disease, the local treatment of the wound, aside from the usual antiseptic measures, should include the use of balsam of Peru, a remedy which has been shown to possess some antagonistic action on the tetanus toxin.

"4. None of the many special methods of injecting the antitoxin has proved of value, and some of them are too dangerous for general use. Subcutaneous injections of serum in massive doses will yield equally good, if not better results.

"5. Spinal injections of magnesium sulphate solution, by eliminating the spasms, will tide many a patient on to recovery, who would die under any form of serum treatment alone. This form of treatment is destined to lower the death rate from tetanus more appreciably than anything that has been advanced heretofore, including the discovery of the specific serum. Great care should be exercised in arriving at the dosage."

*Hesser: Surg., Gynec. and Obst., ix, No. 2, p. 153.

CONVULSIONS OF CHILDREN

Convulsions in children are usually the result of stomach or intestinal irritation. Children of a nervous temperament are more liable to an attack than others. Other causes of convulsion may be attributed to constipation, worms, emotion, fear, or anger, and they also occur at the onset of certain eruptive fevers, such as scarlatina or smallpox, and during the febrile condition in dysentery, cholera infantum, severe burns and scalds, pneumonia, meningitis, or nephritis.

Symptoms

The onset is usually sudden. There is always loss of consciousness, respiration is embarrassed, the head is retracted, features distorted, and the eyeballs fixed, staring, or rolled upward. Occasionally there may be strabismus. There is either rigidity of the muscles of the legs and arms, (tonic) or spasmodic twitching of the muscles of the face, arms, and legs (clonic), the pulse is irregular and greatly accelerated, and frequently the urine or stools are passed involuntarily. The duration of the attack varies in different cases from a few minutes to several hours. When the convulsive seizure ends, the spasmodic movements become weaker and finally cease. Some recover in a few minutes. If the spasm has been slight and the cause transient, respiration and circulation become normal. Others remain dull for a time, their minds bewildered, and they are unable to speak, and, where the cause is grave, the convulsion may recur after a variable period of a few minutes or hours. It sometimes happens in very severe cases that the respiration is so embarrassed and circulation so retarded that congestion of the brain or some of the internal organs results. If the brain is involved, it is indicated by profound stupor. The pupils of the eye do not respond to light, and may be dilated. Gradually the limbs grow cold, the pulse more rapid and feeble, and fatal coma supervenes.

Diagnosis

The physician is not usually summoned until the convulsive movement begins, and he is expected to act promptly with little

knowledge of the patient's previous history. If he is careful to note the position, and appearance of the child, it may assist him greatly in the diagnosis. If he finds that the attack occurred suddenly, where the patient has apparently been in good health, and provided the temperature of the child is not exceedingly high, in the vast majority of cases the cause of the spasmodic seizure can justly be attributed to gastric or intestinal irritation. If, however, from the appearance of the child, there is obviously antecedent disease, or evidence thereof, either pneumonia, whooping cough, meningitis, scarlatina, or, if in the absence of these, there has knowingly been exposure to contagion, and especially if there be high temperature, the cause of the spasm can possibly be attributed to the approach of some acute febrile disease or infection; and lastly, eclampsia may be differentiated from epilepsy by the absence of prodromal symptoms, the clonic form of the seizure, absence of frothing at the mouth; and especially if the child is under six years of age, epilepsy may be eliminated as a possible cause.

Treatment

Unfortunately, a physician is often required to treat the eclampsia in ignorance of the cause, but fortunately the same measures are demanded or applicable to nearly all cases, whether the spasm be symptomatic or sympathetic. As early as possible, unless the patient's temperature exceeds 104°, he should be placed in hot water to which mustard has been added. The hot bath has a very soothing effect upon the nervous system, promotes muscular relaxation, and tends to prevent cerebral congestion. At the same time cold applications should be made to the head (a Turkish towel wrung out of cold water is most convenient).

If the patient is known to have recently eaten fruit or some indigestible substances, or if the stomach seems distended or full, an emetic should be administered. To a child of three or less, a teaspoonful of the syrup of ipecac, repeated in 15 or 20 minutes, will prove efficacious; or syrup of ipecac with the addition of squills or turpeth mineral may be preferable for an older child in lieu of gastric lavage. Inhalations of sulphuric ether or chloroform used very cautiously will serve to control the seizure quickly, and

later an enema of potassium bromides, (20 grains with 5 or 10 grains of chloral) in a little starch water to a child of 4 years should be given and repeated every hour until the spasms are fully controlled. Lastly, a purgative dose of castor oil will prove of value to remove the irritating contents of the intestinal tract.

In a distinctively febrile case where the temperature of the child is 104° or 105°, cold applications to the head, and sponging the body with cool water, is essential, and as soon as the child can swallow, antipyrine or phenacetin in 3 to 5 grain doses should be given to assist in lowering the temperature.

In prolonged and serious cases where the patient remains in a comatose condition despite all ordinary remedies, spinal puncture may be resorted to. The withdrawal of 20 to 30 c.c. of the cerebral spinal fluid has sometimes proved of marked benefit. To prevent the return of the spasm, bromide of potash in 5- to 10-grain doses is the best preventive.

According to Sajous, in convulsions in children, a better sedative than the bromides (the really potent factor in "spasmosan") is solanine—better because even more effective therapeutically and practically nontoxic. It should be used in practically every case of epilepsy. Laxatives and intestinal antiseptics are almost always indicated in this disease; iron and digitalin may be needed; and focal sources of reflex irritation, especially nasal, intestinal, and genital, should always be sought and removed if possible.

EXPOSURE TO COLD—FROST BITES

The effect of prolonged exposure to cold causes at first a depression of temperature, second a retardation of the circulation, and if the fatal limit is reached, death ensues by coma. It is generally conceded that if the temperature of the body from exposure be lowered 30 degrees below the normal standard, death is the result. Some people resist cold far better than others, and the effect of exposure to cold in ordinary circumstances is most apparent among the aged, poorly nourished, the very young, those afflicted with chronic disease, or, lastly, those suffering from alcoholism.

Symptoms of Prolonged Exposure

As soon as the calorific function of the body is not maintained owing to retardation of the circulation, the skin becomes cool and pale, and the muscles become gradually stiff and contract with difficulty. Sensibility is soon lost, and a state of stupor ensues, followed by prolonged sleep or coma, from which the person can not readily be roused. In this state of lethargy the vital function gradually ceases. The influence of the effects of exposure to cold is often first noticed in a feeling of numbness, weariness, dimness of sight, or torpor. The patient reels as if intoxicated and soon falls from a feeling of lassitude or exhaustion. These facts are well known to the Alpine climbers and Arctic explorers, hence their statement that "he who yields to the temptation to sleep must perish," is true.

Treatment

In cases of apparent death from exposure to cold, if the patient's limbs are rigid, the clothing should be removed and the whole surface of the body briskly rubbed with snow, or pieces of ice, or in the absence of either, the body may be placed in cool water for a few minutes and then briskly slapped or rubbed until the capillary circulation returns. Inhalation of amyl nitrate may be used to stimulate the heart, and artificial respiration, and the introduction of oxygen by means of the lungmotor, should be employed.

Hypodermic injections of ether or camphor at regular intervals should be given to stimulate the circulation and heart action. Hot saline enemas may be given as soon as there is evidence of the return of circulation, and warm applications should be gradually applied. When the heart action has been improved, the rubbing should be continued for some time with dry flannel, the patient finally being wrapped in a blanket and placed in a bed in a cool room.

As soon as possible hot coffee, hot tea, or broth should be given at short intervals, and the patient should not be permitted to sleep too soundly.

Frost bites or frozen parts, toes, or feet, fingers or hands, ears, etc., should receive practically the same treatment. Rub care-

fully with snow, or place in cold water and briskly rub until circulation returns. Gangrene or sloughing of the frozen part may require amputation, or curettement, but seldom before the line of demarcation has formed, after which orthoform ointment 10 per cent should be applied to relieve the pain and promote resolution.

A number of writers advocate the use of hot water or hot packs to all frozen parts, claiming good results therefrom. But of the value of this form of treatment I can not speak from personal experience.

SNAKE BITE

According to Wilson* there are practically but four species of poisonous snakes found in the United States, the coral snake, rattle snake, southern water moccasin, and the copperhead. The toxic property of snake venom, although extensively studied, is one of the most complex of all known poisons. The poison of the rattle snake profoundly lowers the blood pressure, destroys the endothelium of the blood vessels, causing multiple hemorrhages, inhibits the coagulation of the blood, and depresses the cardiac and respiratory systems. The poison of the moccasin and copperhead have a selective action on the medulla and spinal cord, especially the pneumogastric nerves.

Prognosis

According to Wilson, who bases his report on 740 cases of poisoning from snake bites, the bites of the coral snake and water moccasin are much more fatal than that of the rattle-snake (large). The bites of the copperhead and small ground rattler, uncomplicated, are practically nil among adults.

Symptoms

The early symptoms following snake bites are often exaggerated or intensified, owing to fright or extreme nervousness, but unless the wound is restricted by ligature immediately, constitutional symptoms may develop rapidly. The individual usually complains at first of severe pain and burning in the local wound.

*Wilson: Jour. Am. Med. Assn., iv, 771.

This is followed by prostration, nausea, vomiting, and symptoms of collapse. The respiration becomes slow, and heart action feeble, but rapid. Tetanic convulsions are not uncommon, and death may occur within a few hours.

Treatment

All modern authors now agree that after receiving the bite, a ligature, (when possible)—string, handkerchief, suspender or constriction by some means—should be immediately and tightly applied three or four inches above the bite. The fangs should then be removed and the wound freely incised or opened to promote free local bleeding. A freshly prepared 10 per cent solution of chloride of lime is then freely applied to the wound and 5 or 6 minims of the same strength solution is injected by means of hypodermic syringe in ten or twelve different places within a radius of two inches, immediately around the wound. The constriction or tourniquet is then released a few seconds, then tightened, and this procedure repeated again after intervals of ten or fifteen minutes, for an hour or more.

Wilson also recommends the administration of nitrate of strychnine $\frac{1}{30}$ to $\frac{1}{20}$ grain hypodermically, repeated at intervals of thirty minutes, as indicated by the condition of the patient, it being in his judgment the best of all respiratory stimulants.

Considerable local sloughing may follow, which should be treated by the application of a 5 to 10 per cent solution of aluminum acetate applied on sterile gauze, or some other mild antiseptic, with the usual dressing.

Weir, Mitchell and Rogers* have recommended permanganate of potash, two to five per cent solution, as the best antidote to the venom of snake bite, provided it is used in direct contact with the virus before absorption.

STINGS:—BEE, WASPS, HORNETS, YELLOW JACKET, SCORPION, ETC.

Several varieties of insects are provided with piercing weapons, but the sting, properly speaking, is found only among the hy-

*Mitchell and Rogers: Brit. Med. Jour., Nov. 11, 1905.

menoptera, such as bees, hornets, or the yellow jacket, and wasps, where it is a modified ovi or egg depository. In wasps, the sting serves the special purpose of paralyzing the insects which are stowed away alive with the eggs in the nest cells.

The scorpion possesses a sting in the pointed telson or tail-piece appended to the extremity of the abdomen, by means of which a poison-infected puncture is inflicted. The sting of the scorpion is not ordinarily fatal, and in many cases does not exceed in severity the sting of a bee or hornet, but may prove dangerous to persons of weak constitution, or an alcoholic.

After repeated inoculation or stinging, man soon becomes immune to the sting of the honeybee or the scorpion, and the poison loses its effect.

In tropical countries, especially in southern Mexico, the sting of a scorpion is said to be exceptionally fatal, which is attributed to the uncleanness or germ-laden condition of the natives, and the viciousness of the scorpion in that latitude.

The immediate effects following the sting of the bee in pronounced toxic cases are severe throbbing pain at the point of puncture, nausea and vomiting, rapid swelling and edema of the part receiving the sting, and at times delirium and exhaustion. Multiple stings of bees frequently produce serious symptoms, especially if a vein is punctured so that the poison rapidly enters the circulation. Acute toxemia, with more or less shock, rigor, and possibly convulsion, are not uncommon, and grave symptoms of septicemia, erysipelas or phlegmon meningitis, followed by death.

The author recalls a case of a young man of about eighteen years of age, who was stung on the wrist by a wasp, or a yellow jacket. Three or four hours later he became unconscious, followed by a stupor from which he could be roused only with difficulty. He remained in this semiconscious condition for twenty-four hours, when he had a pronounced chill or rigor, after which his temperature rose to 106 degrees. He died the third day, evidently suffering from a septic or leptomeningitis.

Bites of flies, bedbugs, fleas, mosquitos, and various insects produce as a rule only local or a minor degree of irritation, and only on rare occasions does any form of infection follow. The

irritation and swelling produced by these insects usually reach their height in a few hours.

Treatment

Bites of insects and ordinary stings are best treated by first bathing the parts with strong soap suds and following this with pledgets of lint or cotton saturated with ammonia water, or a solution of sodium bicarbonate. A saturated solution of camphor and salol in sulphuric ether is a most excellent remedy.

Constitutional symptoms, if present, should be treated by appropriate stimulants, and nervousness, with potassium bromide.

In the more pronounced toxic cases, especially bee stings, the small blister at the point of puncture should be opened and the barb extracted. The poison should then be neutralized with vinegar or ammonia water constantly applied. Multiple stings should be treated in the same manner, and each wound or puncture should receive the continuous application of the alkaline solution until all pain, swelling, and edema subsides.

In the more pronounced toxic stings or bites, where the poison seems to have entered directly into the circulation, besides the excruciating pains, there are symptoms of vertigo, nausea, vomiting, and symptoms of shock, with rapid, irregular pulse and other evidences of toxemia. In this class of cases the patient should be placed in a hot bath, and if the pain is intense, hypodermics of morphine with atropine should be given. All local wounds or stings should be incised and the dressings saturated with aqua ammonia constantly applied, to be followed by a lotion of subacetate of lead and opium. Erysipelas or phlegmon, if they be developed, must be treated on general principles with the effort to eliminate the toxic effects of the poison through the kidneys, skin and intestinal tract, as well as large doses of streptococci serum with a view to prevent septicemia.

Prophylactic Measures

Neal has found the following very successful in preventing bites of insects, gnats, fleas, bedbugs, mosquitos, etc.: Sulphate of magnesia, one ounce dissolved in 1 pint of water. To be applied

freely and allowed to dry on the body without wiping dry. In those especially exposed to mosquito bites, being near water, or on a river or auto trip, he recommends a stronger solution, two ounces to the pint, applied to the surface of the face, neck, ears, and hands, and permitted to dry without wiping. This leaves a fine powder on the surface of the skin which the most blood-thirsty insect will not attack. The solution is healing and cleansing, as well as a preventive. It tends to heal the bites and subdues the consequent inflammation.

BITES OF THE SPIDER, DOG, CAT, HOG, RAT, SKUNK, WEASEL, AND OTHER ANIMALS

Injuries of this character are quite common, and all lacerated wounds, as well as abrasions of the skin, should be regarded as positively septic and treated accordingly. The bite of an enraged or vicious stallion is sometimes severe and extensive. The loss of a finger or a part of the hand, portions of the scalp, nose, ear, or side of the face is not an unusual occurrence, not only requiring primarily very careful aseptic measures, but later, plastic operations and skin grafting are essential to secure good results. The author recalls a case where a farmer in feeding his swine accidentally lost his footing and fell, and before he could secure assistance, he was severely bitten in a number of places, the wounds requiring constant attention for several weeks to heal.

Treatment

Where the bites or wounds are multiple or very extensive, the patient should be anesthetized to render complete cleaning possible, and each wound must be carefully inspected and systematically cleansed. No irritating scrubbing is necessary, but soap and water may be used freely on cotton or gauze sponges followed by the free use of alcohol, turpentine, or sulphuric ether, and lastly, washing with a solution of 1 to 3000 or 4000 bichloride of mercury is advised. In extensive, lacerated bites or wounds, the part may be supported or drawn together by sterile oxide of zinc adhesive plaster, but should never be completely closed. Drainage must be provided for by means of strips of gauze or gutta-

percha tissue, and lastly covered with dressings saturated with a 1:5000 bichloride of mercury solution. Wounds made by cats, skunks, rats or other small animals, after cleansing, should be freely incised, and after thoroughly drying the skin, tincture of iodine by means of a small cotton swab or pipette should be freely applied to every part of the wound, and all such bites or wounds should be left open and allowed to heal by granulation.

RETENTION OF URINE

Inability to void urine accumulated in the bladder may result from exposure, overdistention, stricture of the urethra, paraphimosis, enlarged prostate, or nervous or mental depression or excitability. It is common with inebriates, especially beer drinkers.

Symptoms

Pain of a more or less severe character in the lower abdomen usually accompanies acute overdistention and the pain becomes more agonizing in proportion to the length of time relief is delayed. The distended bladder may be felt above the pubes as an oval or enlarged pear-shaped body. In the slender individual dullness on percussion and fluctuation by palpation may be detected. Rectal examination reveals a globular elastic tumor pressing into the pelvis.

Treatment

Unless there is a previous history of gonorrhea or stricture or an enlarged prostate, a soft rubber or flexible catheter, well oiled, may usually be introduced without difficulty. For an ordinary adult a No. 8 to 10 English (Fig. 99) is the proper size, since experience has shown that a catheter of much smaller caliber, which does not distend the urethral folds, is more difficult to introduce. On reaching the neck or mouth of the bladder a few moments' time, with gentle continuous pressure, should be given to allow the tip of the catheter to overcome the spasmodic contraction of the muscles of the sphincter, after which it will pass readily into the bladder. Where, after repeated efforts it is not found possible to introduce a soft rubber catheter, a silver in-

strument should be used. Under such circumstances it is necessary to employ strict aseptic measures as to instruments and urinary organs. The greatest possible care must also be observed, in the avoidance of undue force, since laceration of the urethra may render catheterization very difficult. The patient should be placed in the recumbent position on a table or hard mattress and

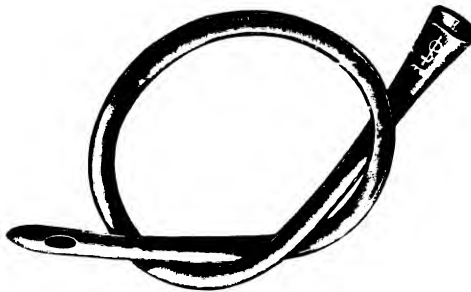


Fig. 99.—Soft rubber catheter.

if the patient is very nervous or passage of the catheter causes undue pain, an anesthetic should be administered. The anterior portion of the urethra should then be distended with two to four drams of pure sterile olive oil and the oil retained by pressure of the fingers back of the glans. With the patient on his back and knees flexed, the penis is put on the stretch and the tip of the catheter introduced with the outer end of catheter held on a lever with the abdomen, well to the right or left of the median



Fig. 100.—McLean's male prostatic catheter.

line. The catheter is gently introduced in this position until the tip of the catheter passes well down to the pubes. The outer end of the catheter is gradually elevated in order that the tip of the instrument will follow the normal curve of the urethra under the pubes. On reaching the neck or mouth of the bladder there is always more or less spasmodic contraction which is best over-

come by gentle continuous pressure, when suddenly the instrument will pass into the bladder. In prostatic enlargement a greater curved instrument or prostatic catheter should be employed (Fig. 100).

Where it is found impossible to introduce a catheter, puncture of the bladder under strict asepsis is a safe and simple procedure. The needle of the aspirator (or in an emergency where an aspirator is not quickly obtainable, a large hypodermic needle attached to an ordinary bulb syringe will answer the purpose) or small trocar should be inserted in the median line about one inch above the pubes, and the bladder thus evacuated. In elderly men or where the overdistention has existed several hours, it is not always the best plan to draw off all the urine or evacuate all the contents of the bladder at once. The safest course is to draw off sufficient urine to afford relief, giving the bladder a few minutes, in order to secure firm contraction, before completing the withdrawal of the urine.

EXTRACTION OF TEETH

It frequently becomes necessary for the general practitioner, especially in rural districts, to extract a diseased or aching tooth. To be able to do so with comparatively little or no pain, is an accomplishment which not only brings comfort to a suffering patient, but will add materially to the standing and popularity of the physician.

Volumes have been written by different dental surgeons describing the various technics evolved in the extraction of teeth, and strong men have been known to labor with all the strength they possessed trying in vain to dislodge a molar from its socket, because they had not properly mastered the simple technic necessary for its successful removal.

As briefly as possible the author will attempt to outline a few of the principles of operative procedure whereby the extraction of a tooth may be accomplished by those not accustomed to everyday practice.

For emergency work the forceps shown in Fig. 101 may be considered essential.

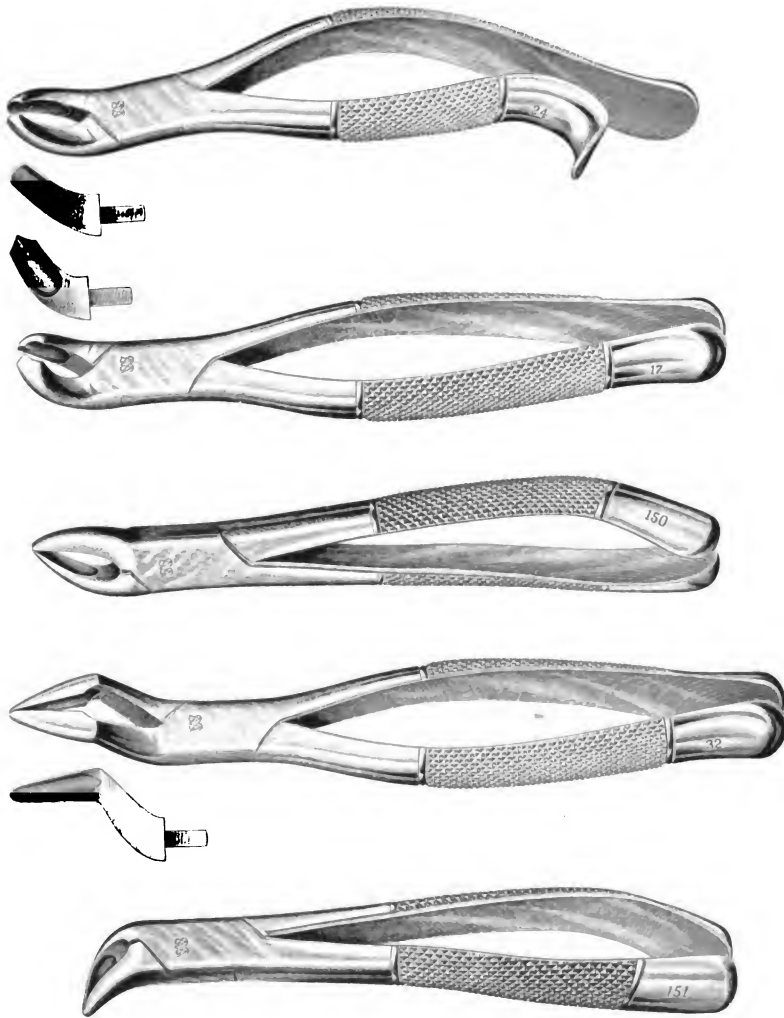


Fig. 101.—Dental forceps.

- 1 Universal upper molar
- 1 Universal lower molar
- 1 Upper cuspid and bicuspid
- 1 Bayonet root forceps
- 1 Special root forceps

Before any attempt at extraction is begun, the mouth of the patient should be rendered as nearly aseptic as possible. This is best accomplished by thoroughly scrubbing the mouth and teeth with an antiseptic solution, and rinsing the mouth thoroughly with water; after which the gums should be carefully dried, and if this can be satisfactorily done, tincture of iodine may be applied immediately to the gums and teeth to be extracted. A gargle of a 10 per cent solution of borolyptol, or some other antiseptic lotion may now be used to advantage, followed by alcohol applied by means of a cotton swab.

The patient should now be placed in a suitable position; in the absence of a dental chair and headrest, a high-backed rocking chair, tilted to suit the operator, and braced by means of obstructions placed under front and back of the rockers, will answer the purpose. The head of the patient being held gently but firmly by an assistant, the local anesthetic should now be introduced. For emergency purposes the author recommends the following formula as it can be instantly prepared, is always sterile, and is especially effective where there is ulceration or infection, since the effects of this form of local anesthesia are prolonged and manifest for several hours or days.

R 1 ampule or 5 c.c. P. D. & Co.
Sol. quinine and urea hydrochloride
Novocaine, gr. iv.

M.

Remove the top of the glass ampule and add the novocaine to the solution.

For local anesthesia dentists are now using E-tablets of novocaine supplied by dental houses. Two E-tablets to 30 minims of distilled water, or, preferably, Ringer's solution, is the usual strength. After the first injection, it is better practice to wait a few minutes and test the degree of anesthesia by inserting the needle and injecting more fluid at various points or places around the tooth, always keeping as close to the tooth as possible, and well within the alveola or socket around the offending tooth. Considerable force is sometimes required to inject the fluid, and no limit is placed on the amount employed. When the patient no longer feels the introduction of the needle, the tooth may be extracted without pain.



Fig. 102.

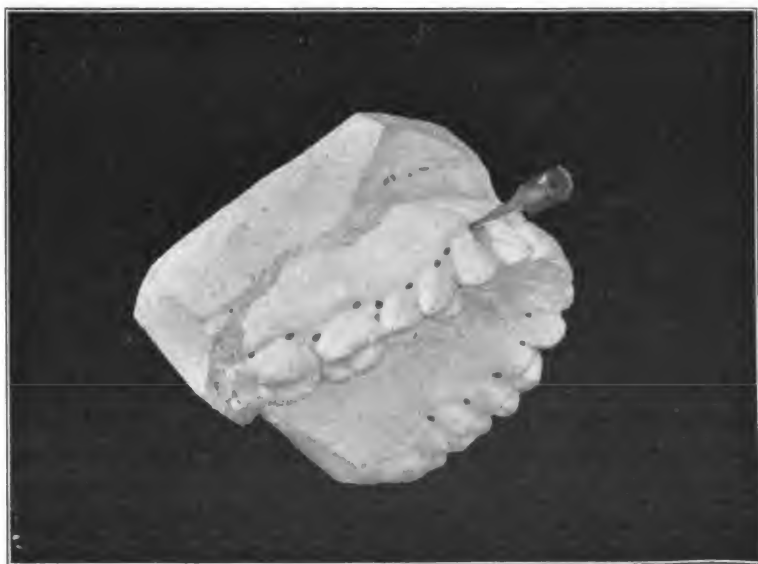


Fig. 103.

Figs. 102 and 103.—The dots illustrate places where the needle should be inserted for emergency cases.

Another popular formula is as follows:

R	Novocaine	gr. x
	Sodium chloride	gr. iv
	Aqua dist.	℥ i

M.

To each c.c. add one drop of adrenalin sol. immediately before using.

With a carefully sterilized dental or hypodermic syringe, with all air expelled from the syringe, insert the point of the needle into the gum, as illustrated in Figs. 102 and 103, between the tooth and process or socket; force the needle well down, gently touching or scraping the side of the tooth, in order to penetrate the periodontal membrane. By so doing the anesthetic fluid will then be forced to the base of the tooth or process. Withdraw the needle, wait from three to five minutes, or until the tissues are noticeably blanched. Test the sensibility of the parts with the needle of the syringe, and if no pain is felt, the needle should be inserted again on the inner and posterior aspects of the tooth, always keeping well within the alveolar process or tooth socket.

The effects of the local anesthetic depend fully as much, if not more, upon the method of its insertion as the formula or fluid employed, and hence the instructions should be followed closely. Before attempting to extract the tooth, tincture of iodine should again be applied to the gums. With the tissues anesthetized select a suitable forceps and bear in mind the following instructions:

Extraction of Teeth From the Upper Jaw

The operator should stand to the right side of, and facing the patient. Grasp the tooth gently, but firmly, with the blades of the forceps. If the tooth or crown is decayed, push or insert the points of the blades well up beneath the gums beyond the decayed portion. Upon the upper central and lateral incisors after grasping the tooth, the force is exerted first outward or toward the lip, and when the tooth is felt to give in that direction, immediately direct or reverse the force, to turn the tooth to the inner side, toward the tongue, then rotate the tooth until loosened, and extract it. These movements may have to be repeated sev-

eral times before the tooth loosens and should be rapidly but gently performed.

The cuspids are removed in the same manner, except the tooth should never be rotated to the mesial or toward the middle of the mouth, but always outward or toward the lips.

Next in order are the upper bicuspid. Upon these the force is first exerted outward toward the cheek, next inward toward the tongue, then rotated and extracted.

Upon the molars the directions of the force applied is practically the same, first outward, or buccal, and second inward, or lingual; but in extracting do not attempt to rotate, but apply the force as if turning the tooth backwards.

Extracting Teeth From the Lower Jaw

In extracting the lower incisors or front teeth, the force should be exerted outwards, towards the lips, with a downward or pump-handle motion.



Fig. 104.—Root forceps.

To the lower cuspids apply the force first outward and then inward (buccal and lingual) and rotate to the distal.

To the lower bicuspid the force is applied first outward then inward and rotate also to the distal.

To the lower, first and second molars, the force should be rocking outward and inward—with the greater force toward the lingual, never try to rotate a molar. The molars are the most difficult to extract, as they commonly have a curved root. Always loosen the tooth in the socket before attempting extraction. The alveolar process will yield to pressure the same as a green stick. Too great haste in the effort to extract a tooth, the same as too great pressure of the blades, may tend to break the tooth or process. Careful methodical force, to thoroughly loosen the tooth, is a time saver in many cases.

Extraction of Roots

The extraction of roots is sometimes an emergency measure but when possible should be referred to a dentist. The special root forceps may be used and are often employed successfully under local anesthesia. The blades must be inserted or pushed over the root until sound of solid parts can be reached, and frequently it becomes necessary to crush through or include the alveolar process in order to successfully remove the root. This is considered a safer procedure than to break off or leave a portion of the root.

CHAPTER VIII

FRACTURES AND DISLOCATIONS

FRACTURES

Preliminary Remarks

Fractures resulting from machinery accidents, railroad injuries, etc., differ materially from ordinary fractures resulting from falls, blows, or muscular contraction, since they commonly occur at the place or point of actual contact, and, hence, instead of the bone separation occurring at the upper, middle, or lower third, the fracture takes place, regardless of muscular attachments directly at the seat of injuries; and when the fracture involves or happens to be in close proximity to a joint (especially the ankle joint), it very seriously complicates the treatment by rendering extension more or less impossible and develops mechanical conditions not found in fractures occurring at the upper or middle third of the long bones, and, lastly, where the fracture occurs in close proximity to a movable joint, it is often a matter of impossibility to secure accurate alignment of the fractured ends and later secure normal joint mobility.

ORDINARY FRACTURES AND THEIR TREATMENT

Fracture of bones result from either external violence or muscular action, and are classified in accordance with their position, shape, degree, extent, or association with injury to the corresponding tissues, or integument.

For convenience in emergency practice, fractures may be classed as simple, or closed; compound, or open; complete, or incomplete; single, multiple, comminuted, and impacted. The terms explain themselves.

Symptoms

The characteristic objective symptoms of fracture are: deformity, or displacement, mobility, and crepitus. The principal subjective symptoms are pain and loss of function. The deformity is due to disturbance of the relation of the fractured ends of the bone, displaced fragments, or shortening (which may be deter-



Fig. 105.—Method of correcting deformity in overriding fracture of sternum. (Preston.)



Fig. 106.—The method shown in Fig. 105 has been supplemented by direct upward pressure on the inner ends of the clavicles with the finger tips. (Preston.)

mined by measurement), and infiltration or swelling of the surrounding tissues. Mobility or abnormal motion of the part involved is always indicative, and an invaluable sign, except in impacted fractures.

Crepitus, or grating sound or feeling, produced by rubbing of the broken bones against each other, is pathognomonic of fracture when present. Crepitus is absent in impacted fractures, when there is much overlapping of long bones, or when the tissues cover, interfere with, or prevent the grating of the fractured parts.

Loss of function is always indicative of fracture, but may be absent in fractures of the fibula alone, in the leg, or the ulna alone, in the arm.

Diagnosis

The history of the case is often of great value, and materially assists in arriving at a definite opinion. The above described objective symptoms are conclusive of fracture. In all complicated fractures, those involving a joint, and open fractures, the examination should be made under anesthesia.

The employment of the x-ray and the proper interpretation of the skiagraph is indispensable, and, lastly, the final examination, as well as adjustment and dressings, should be made under an anesthetic.

VALUE OF THE X-RAY IN FRACTURES

As an adjunct or aid in the study of complicated fractures the x-ray is invaluable, but a thorough knowledge of anatomy is often essential to properly interpret the value of the skiagraph and detect the fallacies so commonly present. It must not be overlooked that the shadows in a skiagraph are always more or less distorted. The disc or cathode terminal of an x-ray tube is comparatively small, the largest, or ten-inch tube, being a little less than an inch in diameter. All x-rays must proceed from this small disc and are not parallel but always divergent; hence, the farther away the plate or negative from this disc, the greater will be the distortion. In other words, "the portions of the object farthest removed from the perpendicular line, between the point of the disc from which the rays diverge, and the plate (negative), will be the most subject to distortion; and changing the plane of the plates, however slightly, also influences the shape of the shadow cast by the rays." (Hare.) Nor is it possible to determine the probable functional use of a fractured limb by means of an x-ray



Fig. 107.



Fig. 108.

Figs. 107 and 108.—Fracture of the spine in the lower dorsal region a few minutes following the accident. Arrow in upper photograph indicates the visible irregularity in the spinous processes. In Fig. 108 the finger is pressed into the depression. (Preston.)

alone, since the fact is well established clinically that marked displacement of fragments and overlapping may occur and not interfere materially with the functional uses of the limb. And it is likewise true that the fractured bones may heal in exact alignment or apposition, and yet in consequence of injury to the muscles, blood vessels, and especially the nerves, the functional uses of the limb may be greatly interfered with or destroyed—facts not revealed by the x-ray or skiagraph.

Treatment of Simple Fractures

Owing to muscular contraction, the fractured ends of all long bones are generally displaced or overlapped. Hence, it is always necessary to employ more or less traction—extension and counterextension—to overcome the displacements and secure accurate apposition of the severed or broken ends. When help is available, one assistant should be employed to make the necessary extension while a second assistant holds the limb above the fracture and makes the proper counterextension, thus leaving the surgeon free to manipulate the broken ends and secure accurate apposition.

Extension should be made as gently as possible in the long axis of the broken bone. Any rough or jerky movements are useless and harmful. If attempts at reduction are painful, or muscular contractions are very strong, a general anesthetic should be first administered.

In all but the simplest fractures, anesthesia should be employed, not only to eliminate unnecessary pain, but to overcome muscular rigidity and enable the surgeon to secure more accurate apposition of the broken bones.

Obstacles to Reduction

Obstacles to reduction of fractures are, muscular rigidity or spasmodic contraction; excessive fat; comminuted fractures, where there are several loose fragments, especially in the immediate vicinity of a joint, where portions of muscles, tendons, or fascia become interposed between the fractured ends; and impacted fractures where the bones are driven together.

Anesthesia, with slow, steady extension will usually suffice to

overcome spasmodic contraction or rigidity of the muscles. Careful manipulation and pushing aside of the muscles and tissues will often remove the interfering tissues.

Impacted fractures of the wrist (Colles') and other such fractures may always be overcome by the Murphy method of over-correction and manipulation. Those of the neck of the femur, however, should never be disturbed.

Tenotomy or division of the tendons is sometimes necessary to overcome the tendency to displacement. It is especially indicated in Pott's fracture, or fracture of the lower end of the tibia and fibula, and when performed subcutaneously, division of the tendo Achillis is often of inestimable value in maintaining reduction.

In comminuted fractures, when it is found otherwise impossible to hold the fragments in apposition, or in spinal and transverse fractures, the modern surgeon skilled in aseptic bone surgery does not hesitate to make an incision, evacuate all blood clots and lymph from the tissues, wire, or by means of bone plates, unite and hold the fragments firmly in position, and close the wound by metal clips. Union then takes place promptly and satisfactorily.

FRACTURES OF THE SKULL

In fractures of the skull where the outer tablet alone is affected, recovery without serious complications may usually be expected, and treatment should be directed toward allaying local pain and tenderness.

Fractures of the skull with marked depression of bone are always accompanied with shock, more or less nausea and vomiting, and symptoms of concussion or other injury to the brain tissues, notably loss of consciousness, or coma, hemiplegia, etc. The danger in this class of skull fractures lies in the degree of compression present, and subsequent inflammation which the spicula or intruding bone excites in the brain tissues.

Fractures of the bones of the skull are always serious, as they occur mostly from the transmission of force, contrecoup, or direct violence to some other portion of the head, and hence, they are associated with great injury to the brain. Hemorrhage from the nose and ears, with marked and prolonged coma, are the charac-



Fig. 109.—Depressed fracture of skull in left parietal region of about eighteen years' standing. Not followed by any late symptoms. Patient presents himself at this time for treatment of slight scalp wound seen at the upper margin of the old depression. (Preston.)



Fig. 110.—Example of the explosive effect of the modern high pressure missile at close range. Wound inflicted with a 32-20 cartridge fired from a Smith and Wesson revolver. (Soft nose bullet.) Picture taken about twenty minutes after injury. Patient lived about one hour. (Preston.)



Fig. 111.—Bullet in head. The arrow points to the opening in the skull through which the bullet entered. (Preston.)



Fig. 112.—Pronounced swelling and ecchymosis of both eyes following small scalp wound on left side of forehead. Condition suggestive of fracture of the base of the skull since there has been no trauma near the patient's right eye to account for its swelling and blackening. (Preston.)

teristic features in all extensive fractures of this kind—the coma resulting from either hemorrhage or bone fracture, or both.

Treatment

Absolute rest is one of the essential elements in the treatment of all fractures of the skull. Well-defined symptoms of compression from depressed bone or blood clot require trephining as early as possible, elevation of the indented bone, and removal of clots, if present, after which sterile moist dressings should be applied. Further than this, the wisest course is not to interfere unless symptoms of irritation or infection later make their appearance, and in all cases the scalp and wound must first be rendered as nearly aseptic as possible.

FRACTURE OF THE NOSE

Fractures of the nose usually occur at the lower portion or base of the nasal bones, as a result of a fall or blow. Both bones are commonly fractured at the same time. The malar, or cheek bones, and the cribriform plate of the ethmoid may be involved. The nasal cartilages and septum are frequently torn loose, and through laceration of either the skin or mucous membrane, the fracture may be compound.

Symptoms and Diagnosis

Swelling of the tissues involved usually follows rapidly, and if the mucous membrane is torn, attempts at blowing the nose cause emphysema or inflation of the tissues, which may extend to the lower eyelids and face. Crepitus is detected readily by grasping the nose with the fingers and making lateral pressure. Hemorrhage from the nose is often profuse, and may prove very obstinate.

Treatment

In compound fractures, the greatest care must be exercised to prevent infection. A thorough application of tincture of iodine, and frequent washing and douching with a 1:5000 solution of bichloride of mercury, are the best means of prevention.

As union of the bones occurs rapidly, the broken bones—especially if depression exists—should be repositioned as quickly as possible. Several ingenious devices have been made to keep the bones in position. The common wire nasal speculum or a



Fig. 113.



Fig. 114.

Figs. 113 and 114.—Old fractures of nasal bones with lateral displacement. (Preston.)



Fig. 115.



Fig. 116.

Fig. 115.—Separation and angular displacement of lateral and septal cartilages to patient's right. (Preston.)

Fig. 116.—Fracture of nasal bones with displacement to right. Partial separation of lateral and septal cartilages with displacement to left. (Preston.)

Kocher director is excellent for the purpose of reducing the deformity, and carefully adjusted adrenalin gauze packing of each nostril will be sufficient to prevent a recurrence or depression of the bones.

Any deviation of the septum may be corrected by means of a small roll of gauze placed on both sides of the nose, and secured by adhesive strips. The nasal pack should be gently removed in twenty-four hours, and the nasal passages cleansed with a solution of peroxide. No repacking is required unless hemorrhage recurs.

In compound fractures, the nasal passages should be kept clean by the frequent use of antiseptic douches.



Fig. 117.—Fracture of the posterior portion of the malar and the anterior end of the zygoma on the left side of the face. Note how the examining finger sinks into the depression and compare it with the finger on the corresponding point on the uninjured side. Eye swollen shut and conjunctiva blood-shot. Photograph a few minutes following the injury. (Preston.)

FRACTURE OF THE MALAR, OR CHEEK, BONE

These fractures occur as a result of direct violence, and impacted fractures are common, the fragments being driven inward, and downward, and are attended with considerable deformity or depression where the zygomatic process is involved. The depressed bone can usually be restored to position by manipulation. When this procedure fails, under strict asepsis, a small incision

should be made, a screw elevator introduced, and by this means the bone elevated.

Union takes place rapidly. For the pain and swelling, the old remedy—sugar of lead and opium wash—if properly sterilized and applied on sterile gauze, makes a most excellent application.

FRACTURE OF THE INFERIOR MAXILLA

Fractures of the lower jaw frequently occur as a result of falls, blows, or kicks. They are attended by considerable pain and inability to move the jaw. The fractures are usually multiple, and if the condyloid process is broken, the chin deviates to the affected side. In fractures of the jaw, the teeth are loosened, and the alveolar process often elevated and displaced. Ecchymosis and swelling of the tissues of the face are usually marked. The deformity, crepitus, and mobility of the parts on inspection, render the diagnosis positive.



Fig. 118.—Dental splints. A. Metallic splint. B. Wire splint.

Usually there is very little difficulty in adjusting by manipulation the fractured bones to their normal position. If there is much overlapping of the bones, the fracture may readily be reduced by inserting the thumbs of both hands (properly protected with gauze) into the mouth over the teeth, and with the fingers on the outside, clasping the jaw, extension and elevation of the broken section may be made.

If there is much tendency to displacement after reducing the fracture, the teeth may be wired, or a mold of gutta-percha may be used as an inside splint over the row of teeth. When the services of a dentist can be obtained, an accurately made dental splint may be secured, which, with an outside wire splint (Fig. 118) applied to further assist in fixation, will usually suffice in the more aggravated cases.



Fig. 119.—Fracture of mandible at symphysis. Mobility apparent on palpation or when patient attempts to speak. Arrow indicates line of fracture. Right central incisor loose. (Preston.)



Fig. 120.—Fracture of lower jaw about twenty-four hours following injury. Line of fracture passes between the lateral incisor and canine on the left side. Note how the posterior fragment is raised. In this instance the fracture is a little oblique so that the fractured surfaces have engaged in such a manner that the posterior fragment is prevented from the usual inward displacement. (Preston.)



Fig. 121.—Fracture of lower jaw immediately following injury. Line of fracture passes between the second bicuspid and the first molar on the right side. Note how the posterior fragment is displaced inward and remains raised when the mouth is opened as a result of the unopposed actions of the right temporal and masseter muscles. This is the usual deformity and should be particularly guarded against in the treatment. If the deformity is allowed to go uncorrected there will result faulty dental alignment, malocclusion, and the chin will be displaced toward the injured side. The further back the line of fracture, the greater the leverage of the displacing muscles. (Preston.)



Fig. 122.—Fracture of the right side of mandible about six weeks after injury and after union had taken place. In this case the inward displacement of the posterior fragment caused by the internal pterygoid muscle has been allowed to go uncorrected and malocclusion and displacement of the chin toward the injured side has resulted. The displacement of the chin is best appreciated when the jaws are closed. (Preston.)



Fig. 123.

Fig. 124.

Fig. 123.--Four-tailed bandage made with adhesive plaster. Head has been covered with gauze to prevent adhesive coming in contact with hair. (Preston.)

Fig. 124.--Same with superfluous gauze cut away. Dressing completed. More convenient and neat than either the ordinary four-tailed bandage or the plaster bandage. (Preston.)



Fig. 125.—Metal dental splint for cementing to the lower teeth. (Preston.)



Fig. 126.—Same splint with the teeth in occlusion. In placing this splint in position the greatest care should be exercised to see that both splint and teeth are thoroughly dry, as otherwise the cement will not hold. The mucous surfaces are walled away with sheet cotton. (Preston.)



Fig. 127.

Fig. 128.

Fig. 127.—Loops of wire passed about teeth of lower jaw preparatory to wiring the jaws together. (Preston.)

Fig. 128.—Loops of wire passed about the upper teeth. (Preston.)

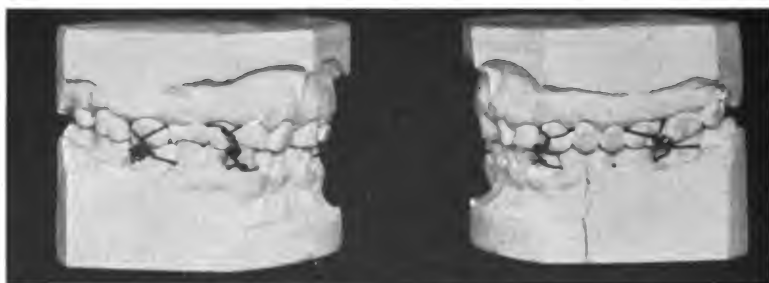


Fig. 129.

Fig. 130.

Fig. 129.—Two points of fixation in wiring the maxilla together. (Preston.)

Fig. 130.—Opposite side in same case showing line of fracture and two additional points of fixation. (Preston.)



Fig. 131.—Simple method of wiring the upper to the lower teeth in fracture of the lower jaw. This is the same method as demonstrated in Figs. 127, 128, 129, and 130. Fragments held in good apposition in spite of dental deficiencies. (Preston.)



Fig. 132.—Fracture of superior maxilla. Patient injured in automobile wreck. Fracture extends through alveolar process, body of bone, and through the orbital process. Posterior fragment displaced downward as may be seen by the disturbed dental alignment. (Preston.)

FRACTURE OF THE SCAPULA

Fracture of the body of the scapula is a very rare occurrence. When present, it is usually transverse, and may be determined from crepitus, local swelling, and pain in attempting to raise the arm to the head. Fracture of the acromion process is not infrequent. Crepitus is not always present, but there is a noticeable flattening of the point of the shoulder, in the absence of dislocation of the head of the humerus. Prior to the twentieth year, instead of fracture, the acromion process is more liable to separate at the epiphyseal union with the scapula.



Fig. 133.—Method of grasping the body of the scapula to detect the presence of fracture. The fingers of the right hand are palpating the spine of the scapula. (Preston.)

Treatment*

“Immobilization of the whole upper extremity, excepting the forearm and hand, is necessary. Localized pressure with adhesive plaster may assist in retaining the fragments in place.

“If there is fracture of the body of the scapula, the forearm should be flexed to a right angle and held in a sling. The skin surfaces coming in contact should be protected by powder and

*Sudder: Treatment of Fractures.

compress cloth. A swathe of cotton cloth should be fastened about the upper arm and trunk. If the cloth swathe is not sufficient to hold the scapula steady, a strip of adhesive plaster should be used, broad enough to extend from the acromion to the elbow.

“Fracture of the Acromion Process.—The skin surfaces must first be protected from chafing. The forearm being flexed, pressure upward should be made upon the elbow, so as to lift the arm and relax the pull on the small acromial fragment. At the same time counterpressure is made upon the inner fragment and,



Fig. 134.—Oblique strapping with adhesive plaster to immobilize the body of the scapula. (Preston.)

incidentally, upon the inner shoulder. This pressure and counterpressure will hold the part reduced. The bandage must be inspected frequently each day, in order to detect and to relieve too great pressure upon the elbow and bony parts of the shoulder.

“Union will take place in from three to four weeks. It is extremely difficult to maintain the reduction of the fragment of the acromion by any apparatus. The one previously suggested meets the indications better than any other. Massage will materially assist in hastening the absorption of blood and will relieve pain. No very great functional disability results if union occurs with bony displacement.”

FRACTURE OF THE CLAVICLE

Fracture of the clavicle usually occurs at or about the middle third. The drooping shoulder, localized pain and attitude of the patient in supporting the elbow and forearm are usually sufficiently characteristic to render the diagnosis unquestionable. Green stick fractures of the clavicle in young children are also quite common. The displacement is not so marked, but the shoulder is noticeably shortened, and bowing of the bone is sufficiently prominent to make clear the diagnosis.



Fig. 135.—Fracture of the right clavicle about twenty minutes after the accident. The injury was sustained by a fall on the shoulder. Note the swelling in the region of the fracture and the slight falling of the shoulder. The manner in which the patient grasps and supports the injured member is characteristic. If need be the diagnosis might be made by inspection alone. Palpation reveals abnormal mobility and crepitus at the site of fracture. (Preston.)

Complete fractures of the clavicle rarely unite without some evidences of deformity at the seat of fracture. The functional use of the arm, however great the deformity, is rarely impaired.

Treatment

The displacement may be readily reduced by slightly elevating the shoulder and forcing the shoulder, and with it the outer fragment, upward, outward and backward, at the same time making digital pressure over the seat of fracture. The displace-

ment corrected, the best method of retention in emergency cases is known as the modified Sayre dressing. A 4-inch roll of oxide of zine adhesive plaster is applied as follows: A gauze pad or folded towel protects the skin of the axilla and chest. Pass the



Fig. 136.—Fracture of left clavicle about twenty-four hours following injury. Note the falling of the injured shoulder and the swelling which obliterates the supra- and infraclavicular fossae. The side view shows the forward displacement of the shoulder which is common in fractures of this bone. (Preston.)



Fig. 137.—Fracture of the right clavicle with the usual symptoms. The following figures show the application of a modified Sayre's dressing to this case. (Preston.)

end of the first piece of adhesive plaster around the arm just below the axillary margin and stitch in the form of a loop sufficiently large to prevent disturbance of circulation in the arm; this forms a fixed point in the middle of the arm; draw the arm and shoul-



Fig. 138.



Fig. 139.



Fig. 140.



Fig. 141.

Preston's modification of a Sayre's dressing applied to the fractured clavicle shown in Fig. 137. In this dressing the hand is not included, which is a great comfort to the patient and does not render the dressing less effective. Sayre's dressing will meet the indications better in the greatest number of cases. When employed in the treatment of children, special care should be taken in watching for signs of irritation to the delicate skin. (See Figs. 142 and 143. The Taylor brace, which is of great advantage in the treatment of children.) (Preston.)

Fig. 138.—First strap of adhesive encircles the arm and then the body, pulling the arm backward.

Fig. 139.—Second strap of adhesive passing down the posterior aspect of the arm, under the elbow and over the opposite shoulder.

Fig. 140.—Third strap of adhesive which passes down the outer side of the arm, under the elbow and under the hand to the opposite shoulder.

Fig. 141.—Another view of the dressing showing the attachment of the straps posteriorly.

der slightly downward and well backward, and carry the adhesive plaster smoothly and completely around the body and pin it to itself on the back to prevent slipping. This first strip of plaster fulfills a double purpose: first, by putting the clavicular portion of the pectoralis-major muscle on the stretch, it prevents the clavicle from riding upward; and, secondly, acting as a fulcrum at the center of the arm, when the elbow is pressed downward, forward, and inward, it necessarily forces the other extremity of the humerus (and with it the shoulder) upward, outward, and backward. It is kept in this position by the second strip of plaster, which is applied as follows: Commencing on the front of the



Fig. 142.

Fig. 143.

Figs. 142 and 143.—The C. F. Taylor brace which is particularly satisfactory in the treatment of fractures of the clavicle in children. (Preston.)

shoulder of the sound side, draw it smoothly and diagonally across the back to the elbow of the fractured side, where a slit is made in its middle to receive the projecting olecranon. Before applying this plaster to the elbow, an assistant should press the elbow well forward and inward, and retain it there while the plaster is continued over the elbow and forearm, pressing the latter close to the chest, and securing the hand near the opposite nipple; crossing the shoulder at the place of beginning, it is there secured by two or three pins.

This completed, most surgeons now apply a Velpeau dressing over this, which not only affords comfort, but additional support



Fig. 144.—First step in application of Sayre dressing. Circular pad to arm.



Fig. 145.—Second step in application of Sayre dressing. Arm pulled slightly backward.



Fig. 146.—Third step in Sayre dressing.



Fig. 147.—Finished Sayre dressing.

to the arm, and a retention pad applied over the seat of fracture will assist materially in preventing deformity. This pad is held in place by a $2\frac{1}{2}$ -inch adhesive plaster; an additional strip of plaster is placed over this, well over the chest and extending down the back over the scapula, but care should be taken not to cause too much pressure over the fractured end, as the clavicle is immediately beneath the skin, without muscular covering. Circular turns of a roller bandage are then passed around the chest, including the arm, from below upward, until the arm is fixed to the body and the dressing is finished.

In fractures of the clavicle occurring in females, greater efforts must be made to prevent deformity. The recumbent position affords the best results. Few, however, have the patience to undergo the plan or method suggested by Cheyne. It consists of lying upon a hard mattress with an unyielding pillow which does not extend in width beyond the shoulders, and long enough to cover the whole back. The pad or pillow inclines from above downward, allowing a somewhat greater elevation for the head and shoulders than for the loins and waist, the thickness of the upper margin of the pad being not greater than 8 to 10 inches, and of the lower, 2 or 3 inches. This position must be maintained for from ten to fourteen days, or sufficiently long to secure union of the fracture.

FRACTURES OF THE ARM

The humerus may be fractured at any place above the elbow, and since the arm can be handled and readily manipulated, the diagnosis is seldom difficult, except possibly when the separation occurs at the upper epiphysis, in which case it may be mistaken for a dislocation. Examination under anesthesia readily discloses crepitus, and renders the diagnosis unquestionable.

Treatment

Fractures of the shaft of the humerus are readily adjusted by extension, and the amount of displacement can be determined with accuracy by measuring with a steel tape the distance from the acromion process of the scapula to the external condyle of

the humerus at the elbow, and comparing the measurements with those of the well arm.

After proper adjustment of the fracture, a short inside splint, well padded, with a light external splint, should be applied to the

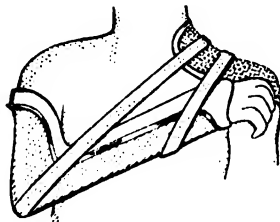


Fig. 148.—Apparatus which may be used in fracture of upper end of humerus or clavicle.

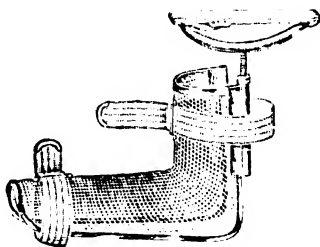


Fig. 149.—The Dupuy wire extension splint for fractures of the humerus.



Fig. 150.—Fracture of both bones of the forearm with the usual backward displacement of the hand. Photograph about one and a half hours following the accident. Angular deformity pronounced, but there is no overriding of the fragments. (Preston.)

arm and held in place with a roller bandage. A triangular-shaped pad should be placed in the axilla, apex upward, and a long shoulder splint placed over the shoulder, extending well down the arm, should be applied, over which a second roller band-



Fig. 151.



Fig. 152.

Figs. 151 and 152.—Fracture of both bones of the forearm with the usual deformity. Fractures about same level. Pictures taken a few minutes following the accident. (Preston.)

age is placed to secure the arm immovably to the body. The forearm is flexed and held by a shoulder support or sling.

If the fracture is transverse, or near the elbow or shoulder



Fig. 153.



Fig. 154.

Figs. 153 and 154.—Same case as shown in Fig. 152 after reduction has been accomplished and splints applied. It will be noted that the posterior splint may be removed for examination of the forearm without disturbing the fixation of the forearm which is still firmly bound to anterior splint. Yucca board has been used in making these splints and serves the purpose admirably but should not be used unless one is experienced in the treatment of these cases and the forearm is closely watched for symptoms of strangulation. (Preston.)



Fig. 155.—Fracture of both bones of the forearm prior to reduction. (Preston.)

joint, some form of extension is required. The forearm must be placed and maintained at a right angle with the humerus. An anterior right-angled splint may be used and a weight suspended therefrom to secure extension. The bend of the elbow must be always well padded to prevent strangulation or injury of the tissues.

The Dupuy wire extension splint (Fig. 149) is easily applied and serves a most excellent purpose in this class of cases.

Fractures of the humerus heal rapidly, but where the elbow or shoulder joint is involved, passive motion must be commenced early by loosening the bandages supporting the parts at the joint and making careful extension and flexion.



Fig. 156.—Ventral splint applied following reduction and held in position by two straps of adhesive—*A* and *B*. (Preston.)

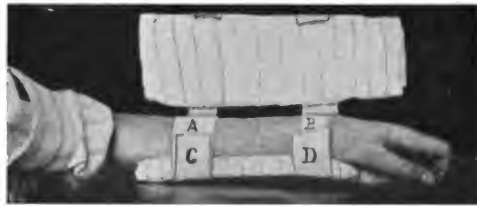


Fig. 157.—Shows same dressing opened up for inspection during the after-treatment. Straps *C* and *D* have been cut and dorsal splint turned back, thus allowing inspection and palpation of the forearm while it is still secured to the ventral splint. (Preston.)

FRACTURES OF THE RADIUS AND ULNA

Fractures of the arm above the attachment of the pronator quadratus must be so adjusted as to maintain the proper axis of the bones in order later to secure normal movements. The elbow should be partly flexed; the forearm and hand should be supported between a long, dorsal splint extending beyond the fingers, and a palmar splint extending to about a third of the palm of the hand (Fig. 167), the splints accurately fixed in supination by adhesive strips, over which roller bandages are placed.

Fractures within an inch of the wrist joint (Colles' fracture) are caused by falls upon the palm of the open hand, thus forcibly forcing the hand on the forearm, and these fractures are always more or less impacted. For this reason crepitus is often absent



Fig. 158.—Low fracture of surgical neck of right humerus. Note the shortening of the arm on injured side. The lower end of the upper fragment is displaced forward, producing the abnormal prominence indicated by arrow, while the lower fragment is displaced upward. Note the tight grasp on the fingers of the injured member. This attitude was assumed even after the patient was requested to release his hold on the forearm higher up. Only slight change in humeral axis. Photograph taken about three hours following injury. (Note evidence of syphilis in nose.) (Preston.)



Fig. 159.—Same case (Fig. 158) seen in recumbent position. Note that the change in position does not influence the prominence on the anterior aspect of the shoulder. It is easy to see that the prominence indicated by arrow is produced by forward displacement of the upper fragment since the axis of the arm and therefore of the lower fragment is only slightly altered. (Preston.)



Fig. 160.—Shows cigar box boards cut to proper size to make diagonal axillary pad. The ends to the right have been hinged together with adhesive plaster. (Preston.)



Fig. 161.—Plaster shoulder cap in position. Note the encircling strap of adhesive plaster. (Preston.)



Fig. 162.—Oblique fracture of humerus a little below its middle with overriding and angular displacement of the fragments. Upper fragment anterior and external to lower fragment. Line of fracture passes below insertion of deltoid, hence the outward displacement of upper fragment, while the biceps and triceps cause the fragments to override. In this type of fracture complete reduction is often impossible without operative intervention. Photograph taken within an hour of the accident. (Preston.)



Fig. 163.—Transverse fracture of the lower end of the humerus. Note the backward displacement of the elbow. Palpation reveals the three bony prominences all displaced backward without disturbance in their relative positions. Sigmoid cavity of ulna not empty. Picture taken about twenty-four hours following accident. Note swelling and slight ecchymosis. (Preston.)

and has led many surgeons into treating these fractures as mere sprains of the wrist until too late to secure good results.

Treatment of Colles' Fracture*

The Murphy method of treating Colles' fracture, now so universally adopted, is given in full on page 286.

*Personally prepared by the late John B. Murphy, of Chicago.



Fig. 164.—Same case as in Fig. 163 in sitting position. Note that the deformity persists with change of position. The elbow is flail-like yet the action of the biceps and triceps produce and maintain the deformity. (Preston.)



Fig. 165.



Fig. 166.

Figs. 165 and 166. Compound comminuted fracture of lower end of humerus. Note the backward and inward displacement which is characteristic. Forearm is covered with blood which accounts for its darkened condition in the photograph. Arrow points to the wound just above and behind the elbow. Picture taken about one hour after injury. (Preston.)



Fig. 167.—Levis' metallic splint.



Fig. 168.—Simple Colles' fracture the result of a fall on the hand. Picture taken a short time following the accident. Appearance typical. (Preston.)



Fig. 169.



Fig. 170.

Figs. 169 and 170.—Radial and ulnar views of recent Colles' fracture. Line of fracture a little higher than usual and dorsal displacement pronounced. (Preston.)



Fig. 171.—Oblique Colles' fracture a few minutes following injury. Forearm somewhat resembles fracture of both bones of the forearm though palpation discloses an intact ulna. The obliquity of the fracture is shown by the deformity. Note how low and pronounced the anterior deformity is as compared with the dorsal outline. (Preston.)



Fig. 172.—Radial and ulnar views of Colles' fracture just before reduction. (Preston.)



Fig. 173.



Fig. 174.

Figs. 173 and 174.—Two methods of grasping the wrist in reducing Colles' fracture. The arrows indicate the lines of force employed. (Preston.)

With the patient under anesthesia, the surgeon grasps the forearm firmly just above the site of the fracture with the hand proximal to the patient. Then he (the surgeon) grasps the carpal section of the patient's hand with the hand distal to the patient's body, and places the thumb of that hand over the posterior surface of the lower fragment. He then presses the thumb of the other

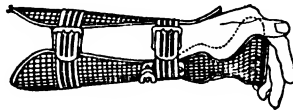


Fig. 175.—Emergency splint for Colles' fracture.



Fig. 176.—Walker's splint for Colles' fracture.



Fig. 177.—Severe compound fractures of the proximal phalanges of the fourth and fifth fingers. Wounds on ventral aspect of fingers. Injury sustained in machine accident. (Preston.)

hand on the nail of the first thumb and increases the deformity by bending the hand and lower fragment backward to a right angle with the shaft. When in this superlative backward position, the thumb of the proximal hand pushes the fragment and distal thumb downward with great force, and he then flexes the hand

and lower fragment forward. He then releases his grasp entirely, and, if the radius remains in a straight position, the reduction is correct. If it does not remain straight without support, then reduction is incomplete and the effort should be renewed.

The only splint necessary is a few plaster of Paris strips ap-



Fig. 178.



Fig. 179.

Fig. 178.—Plaster splint applied to thumb. The curves of the thumb from wrist to thumb-tip are such that it is difficult to obtain a good fit with any other form of splint. (Preston.)

Fig. 179.—Plaster splint applied to dorsal surface of middle finger and back of hand. Secured in place by means of strips of adhesive. (Preston.)

plied on the dorsum of the forearm and hand parallel to the long axis of the forearm and only encircling the forearm and hand for three-fifths of the circumference. In other words, the strips are put on up and down on the dorsum of the forearm and hand, extending from the knuckles to the elbow. A circular bandage is then gently applied, with instructions to the patient to cut the bandage if the hand swells or gives much pain.

An emergency wire splint, slightly curved (Figs. 175 and 176),

or a Walker clay splint, very popular with some surgeons, may be applied in such a manner that the fingers are left free, and the patient encouraged to move them freely to overcome tenosynovitis



Fig. 180.—Splint of cigar box wood padded, bandaged, and placed in position to immobilize middle finger. Note the cotton in palm of hand. (Preston.)



Fig. 181.—The finger splint padded and held in position by strips of adhesive. (Preston.)

or stiffening of the fingers. Massage of the forearm and passive motion of the wrist joint are commenced after the second week.

FRACTURE OF THE OLECRANON PROCESS OF THE ULNA

Fracture of the olecranon process or elbow joint always requires the straight position or complete extension of the arm. Two or three narrow strips of oxide of zinc adhesive plaster properly applied over the process will assist materially in holding the bones in apposition. A well-padded, light, but firm splint extending from just below the axilla to the base of the fingers, and held in place with several adhesive strips and a roller bandage, will usually suffice to maintain apposition and secure good results in the majority of cases.

FRACTURE OF THE RIBS

Except in children in whom the elasticity of the chest wall prevents fracture, the ribs, owing to their prominence and fragile nature, are more liable to fracture than any other bones of the body. Fractures of the ribs result from falls, or blows, and especially from compression between two bodies, as from a wagon wheel or heavy object passing over the chest. The usual seat of fracture is the middle or anterior portions, and the ribs most commonly broken are the 4th, 5th, 6th, and 7th. In railroad injuries, when the force is directly applied, the ribs may be separated from the spinal column or fractured at any place.

Symptoms and Diagnosis

When several ribs are broken, there is always more or less shock, with nausea and vomiting, and some pain, especially on inspiration. Mobility and crepitus may be determined by placing the fingers of one hand over the anterior, and the other hand over the posterior portion of the chest, and forcibly compressing the parts together. Deformity is not always present, the intercostal tissues holding the parts together.

As complications, there may be injury to the pleura or penetration of the lungs by a spicula of bone or the depressed ends of the fractured rib. This is usually manifested by marked deformity, overriding of the fractured ends, with pneumothorax, emphysema, or hemorrhage into the pleural cavity. The expectoration of blood, if marked, is significant of a puncture of the lung tissue.

Treatment

Any angular outward deformity or bulging of the broken ends may be overcome by a compress and bandage. If there is visible or marked depression of the broken ends, it is sometimes reduced by bimanual manipulation with one hand holding the ribs posteriorly, making pressure with the other hand over the sternum, and suddenly releasing it. This often tends to cause the ribs to



Fig. 182.—Adhesive plaster applied for fractured ribs.

spring back into place. Should these efforts fail, and the symptoms call for further interference, under strict asepsis an incision may be made, the bones elevated, fragments removed, or the ribs resected, as indicated.

The most satisfactory method of dressing fractured ribs and the plan now universally employed to immobilize the chest wall, after correcting any deformity or depression of the fractured ribs,

is the application of 2½-inch strips of adhesive plaster (preferably oxide of zinc). They should extend from the sternum in front to and slightly over the spine, commencing at least five inches below the place of injury, and proceeding upwards as high as the axilla. Each strip should be applied following a deep expiration of the breath. The adhesive plasters are allowed to remain two or three weeks, or until recovery takes place.

Complications such as the collection of air or blood in the lung cavity may demand aspiration. Morphine and heart tonics may be employed as indicated.

FRACTURES OF THE FEMUR

Fractures of the thigh or shaft of the femur may occur at any age. In children the middle third is usually the seat of fracture; in adults it is most common at the lower third; while in the aged, fractures of the neck of the femur are especially frequent.

Fractures of the femur are usually oblique. They are the result of direct or indirect violence, and the lower fragment is most frequently drawn upward and to the inner or outer side of the upper fragment, and is rotated outward.

Symptoms and Diagnosis

The ordinary signs of fracture of the shaft of the femur are the same as in any fracture. The displacement is easily located by lifting and lowering the injured limb or allowing the upper fragment to rest upon the arm of the surgeon and permitting the extremity to drop. There is also shortening of the limb, inability to raise the leg, and finally, unnatural mobility, with more or less pain and swelling.

Treatment*

The treatment of fractures of the femur is somewhat complex, owing to the different varieties of fractures and the character of the injury which caused the trouble.

The indications in all cases, however, are to overcome shorten-

*From Dennis, Scudder, and Roberts and Kelly.

ing, control the pain and muscular spasm, and effect fixation of the fragments.

To overcome the shortening, Buck's extension or modification thereof, is still recognized as the most plausible method of treatment. In applying adhesive plaster to the limb, the strips, two



Fig. 183.—Shows adhesive plaster applied to the leg to secure longitudinal traction on the lower extremity. Buck's extension. (Preston.)



Fig. 184.—Shows Buck's extension completed. The strips of adhesive have been fastened to the spreader, and rope pulley and weight attached. The spreader consists of a small square piece of light board with a hole drilled through its middle for the attachment of a light rope. Its purpose is to prevent the adhesive plaster from coming in contact with the skin over the malleoli and to act as an equalizer so that the pull will be the same on both strips of adhesive. (Preston.)

and a half inches wide, should extend from the ankle above the knee joint nearly up to the seat of the fracture, since this gives less freedom of motion and takes the strain off from the knee joint. Over the adhesive plaster a roller bandage should be applied from the base of the toes and as high as the adhesive plaster

extends, carefully protecting the ankle joint from the plaster. The amount of weight required to overcome the shortening varies from five to twenty-five pounds. The less weight that is used the more likely it is that the patient will tolerate the extension for a long time. The counterextension is made by elevation of the foot of the bed.

Another method of maintaining the extension to overcome



Fig. 185. --Siebrandt's improved "Eveready" Buck's extension.

shortening is by the use of a spica or plaster of Paris bandage applied while the muscles are relaxed during the anesthesia. This extension is maintained by the use of strips of perforated zinc or tin under the plaster and applied according to Fluhrer's method.

Still other methods are in use, such as the Thomas extension or hip splint, or the Nathan Smith anterior splint.

The next indication, the control of muscular spasm, is best made by the use of a long splint extending from the axilla to the ankle (Liston's splint), which is part of the Buck apparatus, to which



Fig. 186.—Turck's modification of Buck's extension.

the thigh can be bandaged and the entire limb thus kept in its proper relation to the trunk. If the muscular spasm and irritability are severe, and cause much pain, morphine hypodermically is required to relieve this condition.

The last indication, to keep the bones in apposition, is made by the use of the coaptation splints, four in number, placed around the thigh over the seat of the fracture. They should be two inches

wide, about eight inches long well padded and fixed to the limb by strips of adhesive plaster about an inch in width.

Fracture just below the trochanter is substantially a fracture of the shaft of the bone, and special consideration is given it

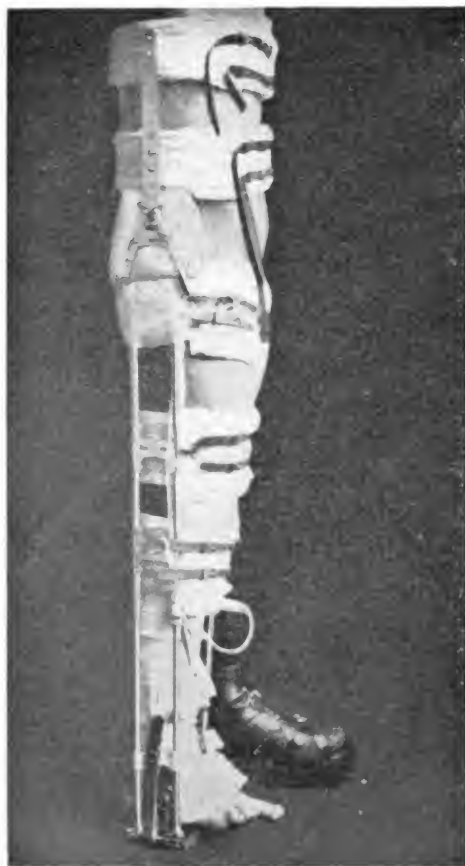


Fig. 187.—The ambulatory pneumatic splint with hip attachment. (Preston.)

only because it permits of but one kind of treatment. The upper fragment is tilted upward and abducted by the action of the psoas and iliacus muscles, which are inserted into the process and abducted by the external rotators. The lower fragment is abducted and drawn upward by the extensor muscles.

The treatment consists in placing the limb in a position that

will cause the axis of the lower fragment to conform to that of the upper fragment. This can be accomplished only by the use of a double inclined splint, such as shown in Fig. 188, Depuy's modification, in which the traction is made in the line of the long axis of the femur while resting upon the upper plane of the inclined splint. This method must be observed in order to prevent union of the fragment with angular deformity.

In cases of extra- or intracapsular fracture of the neck of the femur which so frequently occurs in the aged, the surgeon should use judicious choice as to the special method by which these patients can be best treated. If the patient is in good physical

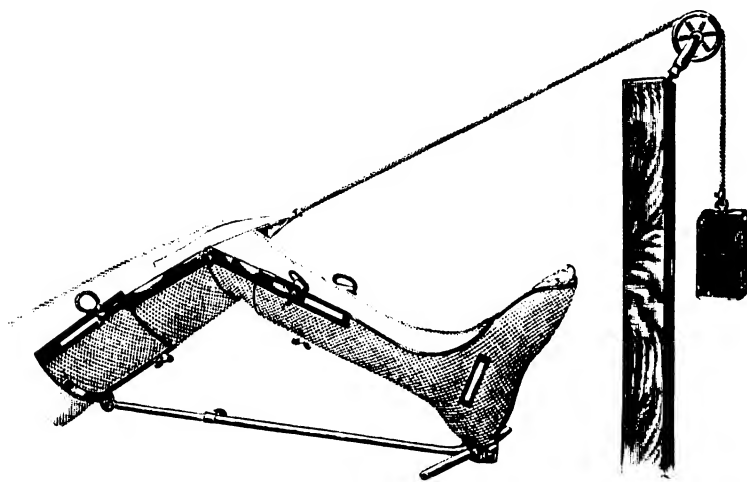


Fig. 188.—Dupuy's combination leg splint.

condition, not too aged, and not of a nervous temperament, an attempt should be made to secure union in the fracture. To this end, Buck's extension with the long Liston's splint should be adjusted, and the weight and pulley attached to the foot in order to steady the limb and overcome a certain amount of shortening.

Aged people can not remain long confined, hence, during the period of repair, special attention must be directed to the avoidance of bed sores and to the maintenance of the general health upon which so much depends in the management of these cases. All parts of the body must be kept strictly and absolutely clean, and the patient supported by the most nutritious diet.

Anodynes may be indicated in loss of sleep or to control pain, while remedies to aid digestion, and tonics containing hypophosphites of lime and soda can be employed to advantage.

As soon as possible, and within three or four weeks, the aged patient should be placed in an ambulatory splint, which permits the patient, with assistance, to assume a sitting or standing position, which is invaluable in many instances.

In younger patients in spiral or transverse fractures it frequently becomes necessary to make an incision and by plates or wires to fasten the bones in proper apposition. For information as to the technic of bone repair and the treatment of ununited fragments, the reader is referred to the various surgical works on these subjects.



Fig. 189.—Fracture of the patella.

FRACTURE OF THE PATELLA

The knee cap, owing to its prominence, is subject to fracture, and failure of the fragments to properly unite is often the cause of much distress, and renders the limb almost useless.

Treatment

The limb should be elevated upon a well-padded inclined plane, with a good large pad under the knee. If there is little or no displacement, as frequently occurs in transverse fractures, the knee may be retained in position by a compress and properly applied adhesive strips. These strips, an inch and a half wide, should be

sufficiently long to enclose the limb and splint, and should be applied obliquely, passing over the upper end of the fragment or broken patella in the form of a figure eight bandage, until the patella is completely covered and fixed in its proper position, after which a roller bandage is applied from the toes to the groin.

Should this method of treatment fail to secure union, operative measures may be employed safely under anesthesia, and strict asepsis. They consist usually of wiring the bones together.

FRACTURES OF THE TIBIA OR FIBULA

When the fibula alone is fractured, there is usually very little displacement, and a simple anterior, posterior, or lateral splint may be sufficient to maintain the bones in apposition. A plaster



Fig. 190.—Fracture of upper end of tibia. Note thickening at point indicated by arrow. (Preston.)

cast is of especial value in this class of cases, and should be applied while an assistant makes extension. After hardening of the plaster, an x-ray examination should be made to ascertain whether or not the bones are in exact apposition.

One of the principal features applicable to all forms of fracture of the leg is to keep the foot well up in order to avoid the tendency to foot-drop or extension of the toes.



Fig. 191.



Fig. 192.

Figs. 191 and 192.—Fracture of both bones of the leg near junction of lower and middle thirds, seen a few minutes after the accident and again four days later. Note the position of the patella looking directly upward while the foot has fallen inward of its own weight. Condition flail-like. In Fig 192 (same leg four days later) the deformity has been corrected and the sides of the fracture box, in which the leg has been placed, have been let down for inspection of the parts and readjustment of the padding. Note the swelling of the leg and the development of blood blebs over the site of fracture. The leg is the most common site for the development of these blood blebs following fracture. The leg should not be put in a permanent dressing until the denuded surfaces resulting from these blebs have thoroughly healed. (Preston.)

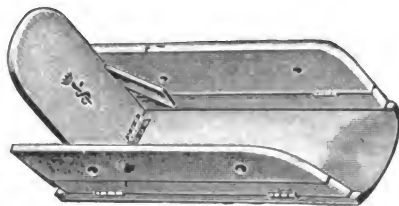


Fig. 193.—Fracture box.



Figs. 194 and 195.—Leg is seen in fracture box with proper padding in place and side of box let down for inspection and readjustment of dressings, and again with fracture box closed and fastened. (Preston.)



Fig. 196.

Fig. 196.—Adhesive plaster applied for traction and counter-traction with the short Desault splint. Adhesive on upper part of leg is applied to pull upward while that on the lower part of leg to pull downward when the splint is in position. (Preston.)

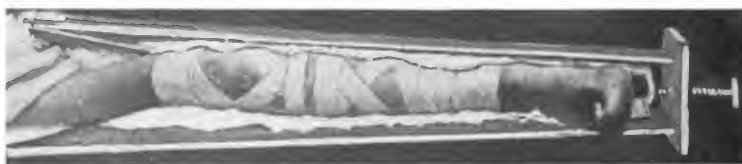


Fig. 197.

Fig. 197.—Short Desault splint in position, with padding about leg. Tightening the screw at the foot of the splint affords traction and countertraction. (Preston.)

The most common seat of fracture of both bones of the leg is in the lower third, and when much displaced, or overriding of the fragments occurs, it may require considerable force to properly reduce the fractures.

Some surgeons prefer to apply a plaster cast, if called upon before swelling of the limb takes place, but such a procedure is



Fig. 198.



Fig. 199.

Figs. 198 and 199.—Fracture of both bones of the leg just above the ankle. Arrows indicate the levels of the two fractures. (Preston.)

not warranted unless the patient is under the constant care of a competent assistant, as sloughing and gangrene has followed too much constriction of the limb; hence, it is better practice after properly adjusting the bones, to wait until all swelling of the tissues subsides before resorting to any fixed dressings.

The posterior Cabot splint has found much favor with the author, but the old time fracture box or Volkmann's posterior splint has many advocates for primary dressing.



Fig. 200.



Fig. 201.

Figs. 200 and 201.—Fracture of both bones of the leg just above the ankle with pronounced inward displacement of the foot. The photographs were taken about twenty minutes following the injury and show an unusual displacement. *I* indicates the upper end of the lower fragment of the fibula. *II* indicates the displaced external malleolus. *III* indicates the internal malleolus. Injury the result of direct violence. (Preston.)

After the second or third week the limb may be encased in a plaster cast and the patient allowed to walk with crutches.

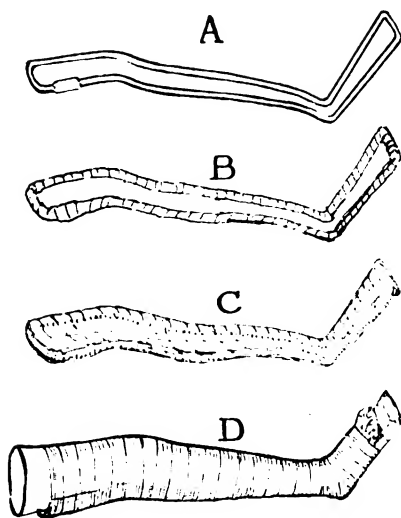


Fig. 202.—Cabot posterior wire splint. *A* shows wire bent to conform to shape of leg. *B* shows same padded and bandaged. *C* shows same after space has been filled in by bandaging. *D* shows splint applied to leg and bandaged in position. (Preston.)



Fig. 203.—Levis' metallic splint for tibia and fibula.



Fig. 204.—Modified Cabot splint fracture of both legs.



Fig. 205.—Pott's fracture of ankle.

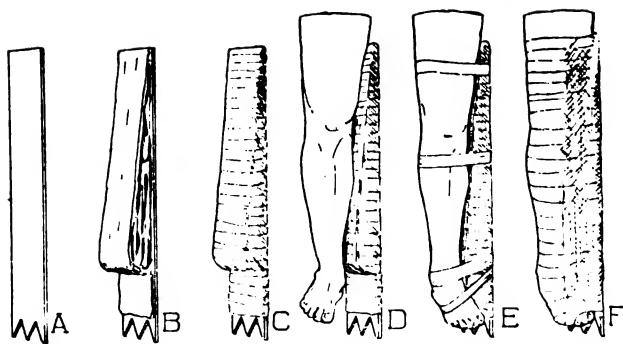


Fig. 206.—Shows the making and use of Dupuytren's splint for the treatment of Pott's fracture. This splint is most satisfactory as an emergency measure and during the acute traumatic reaction. *A* shows board with notched lower end. *B* shows padding applied, which is thickest at ankle. *C* shows same bandaged in position. *D* shows lower extremity in proper relation with splint. *E* shows foot forced into adduction. *F* shows bandages applied. Some of the turns passing over the foot are caught in the notched end of the splint, thus rendering adduction more firm. If the traumatic reaction is extreme, it may be best to dispense with all forms of bandaging and treat the leg in a fracture box or on a pillow splint for the first few days. (Preston.)

POTT'S FRACTURE OF THE ANKLE

In Pott's fracture of the ankle the deformity is corrected by inversion and traction upon the foot. "Dupuytren's splint, consisting of a straight board about three inches in width extending from the lower third of the thigh below the sole of the foot,



Fig. 207.

Fig. 208.

Figs. 207 and 208.—Stimson's plaster splints applied to a Pott's fracture and held in position by strips of adhesive plaster. Note how the foot has been inverted and brought forward until the relations are normal. Results in this case were complete restoration of function and absence of deformity. (Preston.)

heavily padded, is applied to the interior side of the limb, the foot and leg are then bound to this splint in such a manner as to cause marked eversion of the foot, thus correcting the deformity." (Hare.) After three weeks a plaster cast may be applied with great benefit.

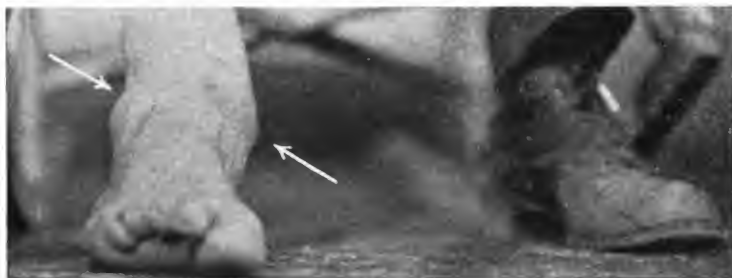


Fig. 209.



Fig. 210.

Figs. 209 and 210.—Simple Pott's fracture the result of a fall on the foot. Note prominence in region of internal malleolus and eversion of ankle, which is present in both upright and recumbent positions. Note also depression about one inch above external malleolus which corresponds to fracture in fibula. Photographed about twenty minutes following accident. (Preston.)



Fig. 211.—Pott's fracture of the left ankle a few minutes following injury. Deformity moderate though characteristic. Note the outward displacement of the foot and the prominence of the inner malleolus. The difference in the contour of the two ankles may be readily recognized even though the shoe on the right foot has not been removed. Inner arrow points to ruptured deltoid ligament. Outer arrow indicates level of fibular fracture. (Preston.)

COMPOUND FRACTURES AND DISLOCATIONS

The modern treatment of compound or open fractures and compound or open dislocations, briefly stated, is as follows:

The tissues in the neighborhood of the wound, including the protruding bone, if any such be present, as well as the surrounding skin, without washing or scrubbing, is painted with full strength tincture of iodine; then with forceps and scissors (bone



Fig. 212.—Compound fracture of leg illustrating Carrel-Dakin method of irrigation.

cutting forceps, if necessary) all tissue in which infected material has been ground, is carefully removed. Next, restore the fragments to position by outward manipulation. All foreign substances within the wound are removed by forcible irrigation with 1:3000 bichloride of mercury solution, and all joint cavities flushed with the same strength solution.

No gauze, however sterile, is permitted to be introduced into the wound for sponging, cleansing or other purposes. The edges of the wound are again painted with the tincture of iodine, and, if possible, the wound closed with metal clips in place of sutures.

The most dependent portion of the wound is left open for drainage, but no drainage tube or gauze or any other foreign substance is permitted to remain in the wound.

If the fragments can not be retained in exact apposition, put on extension, and around this a wire gauze frame, well padded and supported to hold the best possible position. No wire, nails, plates or screws, or any other such materials are admissible in the primary dressing of a compound fracture at any time preceding the healing of the soft parts.

Seven to fourteen days following the closure of the skin wound



Fig. 213.—Compound fracture, great loss of superficial tissues, periosteum stripped free from the tibia. Method of application (Turkish toweling saturated with dichloramine-T covered Carrel tubes).

and healing of the tissues, aseptic bone surgery is practical. (J. B. Murphy).

Unfortunately, many cases of compound fracture of the leg accompanied with extensive corresponding injury to the skin—railroad injuries, etc.—will not heal without more or less sloughing. Many limbs have been saved, to the author's personal knowledge, by wiring the bones, when they could not otherwise be held in apposition, even during or in the presence of serious infection; the suppuration being finally overcome after continuous irrigation with mild antiseptic solutions. It is in this class of cases that the Carrel-Dakin treatment is so highly extolled. See Figs. 212 and 213.)

DISLOCATIONS

Dislocations are classed as either simple or compound. A simple dislocation is one in which the bone has been forced or slipped from its socket without other injury than rupture of the capsule. In compound dislocations there is a wound of the integument or skin which exposes the joint. By complicated dislocations is meant that in addition to the dislocated bone, there is a fracture involving one or both of the displaced bones, or laceration of an important artery, vein, or nerve. Lastly, a dislocation may be either partial or complete.

Diagnosis

Dislocations are distinguished from fractures by (1) absence of crepitus, (2) marked deformity, immobility or limited motion, and (3) when the dislocation is reduced, the deformity or displacement does not return, whereas in fractures, it reappears as soon as the force is withdrawn.

DISLOCATIONS OF THE INFERIOR MAXILLA

The lower jaw is sometimes dislocated in gaping and from direct violence. It is habitual in some individuals, and is exceedingly painful. The dislocation is usually unilateral or confined to one side, and is distinguished by the twisted appearance of the lower jaw or chin being forced towards the opposite or uninjured side.

When both condyles are thrown out of place, known as bilateral dislocation, the chin is unduly prominent and the lower teeth protrude beyond the upper. The mouth is partially open and the lower jaw is fixed or immovable.

Treatment

The patient should be seated in a chair, with an assistant holding or supporting the head. The surgeon standing in front of the patient, having first protected both thumbs with sterile gauze or cloth, passes them into the mouth well back over the molar teeth on both sides, grasping the front of the jaw with the fingers,

then by a sudden downward and backward pressure upon the molars, and quickly elevating the front of the jaw with the fingers, the dislocation is easily reduced. A few whiffs of chloroform is sometimes necessary in obstinate cases, or where the pain is excessive.

DISLOCATION OF THE CLAVICLE

A dislocation of the clavicle is the result of violence, and may occur at the sternal or acromion end of the bone. In dislocations of the sternal end, the reduction is effected by drawing the shoulder well backwards and at the same time making pressure over the end of the dislocated bone. Or, if it is a backward dislocation, the bone may be brought into place by drawing the shoulders upward and backward. After reducing the dislocation, a compress should be placed over the articulation and held in position by adhesive plasters, and fixation of the arm in Depuy's splint after the patient is allowed to get about, may be necessary to prevent recurrence. Recovery takes place usually in from five to six weeks. Reduction of dislocation of the acromion end of the bone is accomplished by the same method, but it is far more difficult to maintain reduction. In order to retain the bone in place, the Stimson method should be employed. It consists in applying a long strip of adhesive plaster three inches wide, the center being placed over the flexed elbow and its ends carried up in front of and behind the arm, crossing over the end of the clavicle and being secured on the front and back of the chest, respectively, while the bone is held in place by pressure upon the clavicle and the elbow. For additional security the forearm may be supported in a sling and the arm bound to the side of the chest. Wiring the dislocated end of the bone in place has been practiced with advantage. (Hare.)

DISLOCATION OF THE HUMERUS

The shoulder joint dislocations consist of the displacement of the head of the humerus downward and inward into the axilla, called subglenoid; second, forward, subcoracoid; third, backward on the dorsum or scapula, or subspinous; fourth, subclavicular.

The symptoms of dislocation of the head of the humerus which are common to all varieties, are, a restriction in the shape of the shoulder; the rotundity of the shoulder is replaced by flattening; the elbow stands away from the body; and it will be found impossible to place the hand of the injured limb upon the shoulder of the sound side while the arm rests against the chest. There is always marked restriction of the movements of the shoulder joint, and the displaced head of the bone can frequently be located by the fingers. Pain is very marked and is often accompanied by numbness of the fingers in consequence of pressure upon the axillary nerves. (Hare.)

There are various methods of reducing the dislocation of the shoulder. In the first two mentioned varieties, proceed as follows: After the patient has been anesthetized, flex the forearm upon the arm, and while the arm is elevated to a right angle with the trunk, rotate gently forward by depressing the hand and forearm; or place the knee in the axilla to serve as a fulcrum, and press the head of the humerus outward, using the shaft as a lever; or laying the patient down, place the heel against a pad in the axilla, and grasping the wrist and elbow, make steady traction, meanwhile prying the head of the bone outward with the heel. Reduction may also be effected by manipulation; grasping the shoulder with one hand and the flexed elbow with the other, make extension at the elbow, drawing it from the side with slight rotary motion outward; when extension is fully made, raise the elbow with the arm and describe a semicircle towards the sternum and face, then suddenly depress the elbow upon the chest, rotating the head of the humerus inward, with the thumb of the right hand giving the proper direction to the head. This maneuver may have to be repeated several times.

In the subspinous form of dislocation, make extension, or resort to the method of standing behind the patient and drawing the elbow backward and rotating the bone, with the thumb of the right hand guiding the head to the joint.

Reduction by extension and counterextension is the most common and successful method. In subglenoid dislocation, extension of the arm at right angles with the thorax is very often successful. Following reduction, a shoulder splint should be applied, a

small pad being placed in the axilla, the arm being flexed against the side of the body by a roller bandage, and the forearm supported in a sling for a week or ten days, after which the patient should be encouraged to use it, and passive motion and massage will tend to hasten recovery.

SIMPLE METHOD OF REDUCTION OF SHOULDER DISLOCATIONS

Caesar, in the *Lancet*, London, recommends the following method: "Having divested the patient of all clothing necessary—it is not always requisite to remove the vest and shirt—place him



Fig. 214. Outlined x-ray of a low subcoracoid dislocation of shoulder. (Preston.)

on the ground in a sitting position and grasp the wrist of the injured side, a third party doing the same with the sound one. Then raise both arms straight above the head, taking care to keep them parallel, and extending them upwards till the patient is



Fig. 215.—Examining depression below the shoulder. Note how, with moderate pressure, the fingers sink in below the acromion. Photograph taken just after the accident and immediately prior to reduction by Kocher's method. (Preston.)



Fig. 216.



Fig. 217.

Fig. 216. —Subglenoid dislocation of right shoulder. The head of the humerus lies below the palpating finger. While plowing the share struck a rock and the handles of the implement were thrown violently upward and the right shoulder dislocated. (Preston.)

Fig. 217. —Same case. The head of the humerus lies between the two index fingers. The brachial plexus and pulsating axillary artery can be felt stretched across the head by the fingers palpating in the axilla. (Preston.)

just raised from the ground, at which point a click is heard and felt, and the dislocation is reduced without further manipulation, except that occasionally in cases of subscapular dislocation



Fig 218.—Same case after luxation had been reduced. Arm bandaged and fixed to side by strip of adhesive encircling the chest. (Preston.)



Fig. 219.

Fig. 220.

Fig. 219.—Posterior dislocation of right shoulder. The humeral head projecting on the posterior aspect of the shoulder is plainly visible. Note shortening of arm and change in axis.

Fig. 220.—Palpation of displaced head. Its position is outlined by the two index fingers and thumbs.

it may be necessary to slightly rotate the arm from right to left in the case of left, and from left to right in that of the right arm. These movements are, of course, carried out during extension."



Fig. 221.



Fig. 222.

Figs. 221 and 222. Simple backward dislocation of the elbow about half an hour following the accident. Note the depression or dimple behind the elbow which is characteristic of this condition. Fig. 222 shows palpation of same case. The tip of the thumb rests in the depression on top of the head of the radius. The sigmoid cavity of the ulna lies between the thumb and index finger of the examining hand and is felt to be empty. The leverage of the triceps is increased while that of the biceps is lessened and hence the position of least pain is greater than semiflexion. (Preston.)

DISLOCATION OF THE ELBOW

The elbow joint may be dislocated by displacement of the ulna or radius backward, forward, inward, and outward, the last two being but partial. All examinations of injuries to the elbow should be made under anesthesia, to determine the exact position of the bones, and whether or not there is a transverse fracture of the humerus, or one of the condyles or of the olecranon, which so frequently happens in this class of cases.



Fig. 223. Forward luxation of the head of radius. Prominence indicated by arrow is caused by the displaced radial head. Note the exaggerated carrying angle which results from the head of the radius not bearing on the capitellum of the humerus. Flexion limited by the displaced radial head. (Preston.)

Treatment

To reduce backward and forward dislocations, the patient is seated in a chair, the knee of the surgeon should be made to press in the bend of the elbow, and the arm should be flexed forcibly, or slightly around it. Another method of reduction known as Liston's is as follows: The patient being seated, the arm and forearm is carried directly backwards; extension of the forearm from the hand or wrist is made by an assistant, while the surgeon

seizes the olecranon process with the fingers of one hand and places the palm of the other hand against the front or upper part of the forearm and pulls forcibly backwards.

Where the head of the radius is dislocated forwards, the reduction is made by first flexing the forearm upon the arm to relax the biceps muscle, and while extension is being made from the hand and counter extension from the arm, the surgeon presses the head of the bone into place. After reduction the arm should be secured with the elbow flexed at a right angle and held by a well padded anterior angular splint. A compress is also placed over the interior surface of the joint. The splint should be changed at intervals of two or three days and worn for several weeks. All violent flexion, pronation or supination of the arm should be avoided for some-time, as it is often a matter of several weeks before repair of the capsular ligament is sufficiently firm to prevent recurrence of the displacement.

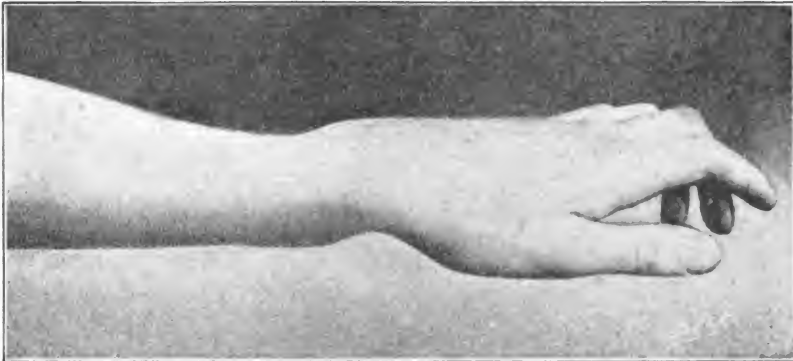


Fig. 224.—Dislocation of the wrist.

DISLOCATION OF THE WRIST

The wrist bone is dislocated by displacement of the carpal bones forward or backward. Reduction is made by extension in the straight line, in all cases, with slight rocking or lateral motions if necessary.

The after-dressings consist in placing a broad or flat splint upon the back or posterior surface of the arm and hand, and extending well up on the forearm.

DISLOCATION OF THE FINGERS

The fingers are liable to dislocation and are generally very easily reduced by means of extension and counterextension, aided with bandages tied upon the finger in the form of a "clove hitch." The displacement of the first phalanx of the thumb is



Fig. 225.



Fig. 226.

Figs. 225 and 226.—Recent backward dislocation of the second phalanx of the middle finger the result of a twisting strain. Base of the second phalanx lies behind the head of the first phalanx. Reduction easily accomplished by traction and countertraction followed by flexion. (Preston.)

sometimes difficult to reduce owing to the escape of the head of the metacarpal bone between the two tendons of the flexor brevis, where it is lodged as in a buttonhole. Reduction is effected by first pressing the metacarpal bone firmly to the center of the palm to relax the short flexor; then considerable force applied in extension upon the phalanx tends to relax the tissues of the buttonhole by dragging the thumb away from the wrist, then, by acute flexion, the bone is restored to its place.

Should this method fail, with a very narrow bladed tenotome divide the insertion of the flexor tendon, after which the dislocation is readily reduced by extension.



Fig. 227.—Ventral dislocation of second knuckle. Easily reduced. (Preston.)



Fig. 228.—Backward dislocation of left index finger. The head of the first phalanx projects through the skin. This type of dislocation almost invariably becomes compound by tearing of the skin on the ventral aspect of the finger opposite the joint. (Preston.)

DISLOCATIONS OF THE HIP JOINT

The several positions of the head of the femur with reference to the socket after dislocation may be named as follows: First, the dorsal, including the anterior, oblique, and the supraspinous; second, the thyroid, including that on the perineum and on the thyroid foramen; the pubic and subspinous.

Though the head of the bone may be primarily luxated in various directions, yet the downward dislocation is by far the most common, as the capsula is thin and weak at this part, and flexion, by which the ligament is relaxed, with adduction or abduction, is the habitual attitude of the thigh in action.

From this position the head of the bone readily passes to the dorsal, thyroid, or pubic regions. Thus all regular dislocations may be secondary. These several positions are sufficiently well recognized by digital examination, unless the patients are very fleshy or muscular.

Diagnosis

Dislocation of the hip is most often confounded with fracture of the neck of the femur. But little difficulty in distinguishing them should be experienced, if the surgeon bears in mind the following facts: that in dislocation of the femur the trochanter is always prominent, and the absence of crepitus and fixation or immobility of the joint, and inability to restore the limb to its proper length by ordinary force, will usually suffice to distinguish between dislocation and fracture.



Fig. 229.—Reduction of the common backward dislocation of the hip. In Bigelow's method the thigh is flexed to a right angle, adducted, rotated inward, *lifted*, circumducted outward and extended. The lifting of the thigh is the essential step in the reduction of backward dislocations and may be aided by counterpressure with the unbooted foot as shown in this plate. In Bigelow's method of reducing anterior luxations the thigh is flexed to a right angle (as shown in this illustration), adducted, rotated inward, adducted and extended. This modification is readily understood if the position of the head in anterior luxations is kept in mind. (Preston.)

All doubtful cases, especially those of fleshy patients, should be submitted to an x-ray examination for verification.

Treatment

Reduction of dislocation of the hip is now almost always accomplished by manipulation—extension and counterextension being only resorted to when other methods fail.

In reduction by manipulation (Hare) the patient is placed upon his back upon the floor or a firm table, and after thorough relaxa-



Fig. 230.—Stimson's method of reducing posterior luxations. The weight of the lower extremity pulls in the direction indicated by the arrow and this alone may be sufficient to effect reduction. Downward pressure, however, with the hand, as shown, will render the method more certain. (Preston.)



Fig. 231.—Preston's modification of Bigelow's method. The thigh is "lifted" (raised sky-ward) by the surgeon's shoulder while counterpressure is exerted on the anterior-superior iliac spine. The opposite hand exerts direct pressure on the trochanter and prevents it from riding around the rim of the acetabulum. It has been the author's experience that difficult cases may be handled in this way after the unmodified Bigelow's method has failed. An anesthetic is often essential to the reduction of dislocations of the hip, especially in well-muscled persons. (Preston.)

tion of the muscles by anesthesia, the surgeon grasps the ankle of the injured limb with one hand and the front of the knee with the other. The leg is now flexed on the thigh and the thigh on the pelvis. Flexing the thigh in iliac dislocations relaxes the iliofemoral ligament, and in ischiatic dislocations, this disengages the head of the bone from the obturator internus muscle. The limb is then adducted and carried to the sound side, rotated slightly outward and inward and finally by an external circular motion, is swept across the abdomen and brought down in a straight position opposite its fellow. Adduction brings the head of the bone close to the articular cavity, while external rotation and the circular motion shortens the outer branch of the iliofemoral ligament, and raises the head of the bone over the acetabulum. Under this manipulation the head of the bone usually slips into its socket.

It occasionally happens that after flexing the thigh upon the abdomen, instead of carrying the limb over the abdomen towards the sound side, or well leg, the opposite plan of carrying the knee and thigh outward in the opposite direction may often prove successful in reducing the dislocation.

The after-treatment consists in confinement in bed for two or three weeks, the limb being immobilized by simply bandaging the knees together.

In elderly people, the application of Liston's long splint from the axilla to the ankle often proves the best method of securing immobilization and preventing recurrence.

DISLOCATIONS OF THE KNEE CAP, OR PATELLA

The patella, or knee cap, may be displaced outward, inward, and on its own axis. Reduction is made by elevating the limb to relax completely the quadriceps muscle, and pushing the patella into position. If this method fails, forcible flexion of the thigh and sudden straightening of the leg while pressure is being made over the patella, will frequently prove successful.

The after-treatment consists in the application of soothing lotions and the maintenance of the leg in a straight and elevated position.

DISLOCATIONS OF THE KNEE JOINT

The knee joint is usually dislocated by displacement of the tibia backward, forward, outward, and inward, but in general the dislocation is incomplete. The reduction, under anesthesia, is



Fig. 232.—Backward dislocation of left knee.

usually effected without much difficulty by extension and flexion. Making extension and flexion over the edge of a table or the surgeon's knee is likewise found to be successful.

After reduction, a posterior Cabot splint or some other fixed splint should be applied and the limb kept at rest for three weeks, after which passive motion and massage may prove beneficial.

DISLOCATION OF ANKLE JOINT

The ankle joint is frequently dislocated by the displacement of the tibia forwards or backwards. Reduction is effected by ex-



Fig. 233.—Backward dislocation of ankle.

tension and counter extension combined with pressure. Division of the tendo Achillis is frequently found necessary in order to maintain the bones in apposition after reduction, as this dislocation is almost always accompanied with fracture of the fibula and rupture of the internal lateral ligament. Compound dislocations are not infrequent at the ankle joint, and always demand the most judicious care. By conservative measures in young and healthy persons, where the main artery and nerves have escaped damage, the limb and joint may often be saved.



Fig. 234.



Fig. 235.

Figs. 234 and 235.—Case of backward dislocation of the calcaneum and scaphoid on the astragalus. (Backward subastragalar luxation.) The calcaneoastragalar joint has been dislocated and the articulation between the astragalus and navicular has been entirely broken up. The head of the astragalus is seen presenting in the wound with the tendon of the tibialis anticus lying internal to it. Result of falling down; an elevator shaft. The foot below the astragalus is displaced backward. Note the prominence of the heel. (Preston.)

DISLOCATION OF THE CARTILAGE OF THE KNEE

Dislocation of the semilunar cartilage of the knee is not an uncommon accident. It results from a twisting of the leg when the knee is slightly flexed, or the sudden arrest of the foot in extension, as in running and stubbing the toe. It has frequently followed from a kick against some solid substance or live animal, as a pig or a cow.

The symptoms are quite marked and characteristic of the in-

jury; viz., sudden pain and fixation of the knee in a flexed position, with inability to walk.

Treatment

The cartilage may be displaced either outward or inward. If outward, the cartilage projects beyond the margin of the articular surface, and by placing the limb over the edge of a table, with an assistant to make a downward extension and flexion, the surgeon will be able by digital pressure to force the cartilage back into position. Should the cartilage be displaced inward, that is, lodged in the intercondyloid notch, flexion and extension, with



Normal.

Dislocated.

Fig. 236.—Forward dislocation of astragalus.

outward and inward rotation of the leg or tibia will accomplish the reduction, especially under anesthesia. After reduction, a plaster of Paris spica bandage should be applied and the knee kept immovable for from ten days to two weeks; this to be followed by careful massage and the use of an elastic knee cap for several months.

DISLOCATION OF TARSAL BONES

The bones of the foot may be dislocated from their position, and generally the accident is of such violence as to cause serious injuries to the ankle, and often of such a crushing nature as to

require amputation of the foot. Dislocation of the astragalus is the most serious. The dislocation of this bone may be forward, outward, or inward, or it may be rotated on its axis. As a rule, if the dislocation is simple, attempts at immediate reduction should be made, and this is best effected by extension of the foot with counterextension upon the leg, and pressure over the displaced bone. If there is severe laceration and other injuries, instead of attempts at reduction, resection of the bone is required.

For the treatment of compound dislocations and fractures, the reader is referred to the Carrel-Dakin treatment of wounds.

CHAPTER IX

AMPUTATIONS

Emergency amputations are sometimes necessary to preserve life from the consequence of severe injuries, and are justifiable only when the injury is so extensive as to destroy the arteries, veins and nerves, and thus render all hope of recovery with a fairly useful limb a matter of impossibility. No operation is approached with more reluctance by the surgeon than the amputation of a limb, and under modern methods of asepsis many limbs have been saved which in earlier times would have been sacrificed, and the author believes the time will come when surgical technic will be so perfected as to banish the necessity for amputation; but unfortunately at this day and age not all surgeons are Gorgases, and the technic of transplantation, splicing of the arteries, veins and nerves has not as yet been so perfected as to make it possible for the modern surgeon to attempt to save a limb by such methods, especially in the crushing, mangling railroad or machinery injuries of today.

As students, we older physicians were taught what was then called the principles of mechanical surgery. We were informed that in amputation, to secure a serviceable result a limb should be removed (1) in the continuity of the shaft, or (2) in the contiguity or articulation of the bone. These divisions are now obsolete and unimportant. The safety of the patient and a serviceable stump can be made without reference to continuity or contiguity. In the upper extremities all surgeons favor the least possible sacrifice of the part, while in amputations of the leg the stump to be used in locomotion, requires breadth, firmness, and a good covering over the end of the bone that sustains contact with the artificial appliances, and, hence, the place of amputation must be selected which will best secure these conditions.

TIME OF OPERATION

In all emergency cases in which the mutilation of the parts and destruction of the limb is self-evident, the amputation should be made immediately following reaction. In the presence of uncontrollable hemorrhage, capillary oozing, etc., after administering stimulants and restoratives, it may not always be safe to wait for reaction, and, therefore, when collapse seems imminent from loss of blood, the operation, regardless of shock, is often justifiable.

METHOD OF AMPUTATION

The oldest method in performing amputation of the limbs was extremely simple. A circular incision at right angle to the long axis of the bone was made and carried down to the bone, the soft parts were then pushed or stripped back from the bone so that when the latter was sawed off, the stump would be covered without any tension. The arteries being tied, a small rubber drainage tube was inserted and six or eight stitches were introduced to hold the skin and parts together. The dressings we now use are subiodide of bismuth gauze or other antiseptic dressings placed over the stump and finally covered by sterile gauze, held in place by a suitable bandage.

The stump is then placed on a splint and fixed by a bandage over stump and splint to prevent the painful muscular contractions or jerking, so common after amputations.

The patient is then placed in bed and the limb slightly elevated on a pillow.

The dressings are changed usually the morning following the amputation, as there is always free drainage. Subsequently the dressings are changed only as often as deemed necessary. The drainage tube is usually removed the fourth or fifth day, depending upon the amount of the discharge. The metal clips are removed gradually in from seven to ten days, when the wound is practically healed.

One-inch strips of oxide of zinc adhesive plaster should then be applied to guard against separation of the skin flaps and aid materially in shaping the stump. When the limb has nearly

healed, a firm bandage should be applied as tightly as can be comfortably borne to prepare the parts for an artificial limb.

While it may be of material benefit for the surgeon to be familiar with all the various ideal or typical methods of amputations, points of election, etc., and the forms of the various shaped skin flaps for the different situations, nevertheless, it is of more practical importance for the surgeon to use his best judgment and modify any of the various methods that to him will best meet the requirements of the individual case, to provide a suitable covering and form a satisfactory stump.

In amputations of the leg, the position of the cicatrix is of great importance. The flap should be so planned that the line of union lies on the posterior surface and well up behind the bone. If the scar is on the anterior surface of the leg, the posterior muscles of the limb being so much stronger, tend to draw the scar down directly over the bone. Again, if the scar is on the anterior or front surface of the leg, in walking or carrying the leg forward, most of the weight of the artificial limb will come directly upon the scar, and cause it to become more or less inflamed.

The "hooded" flap, with the skin incision well up on the posterior surface of the limb is thought by many to be the most popular and satisfactory of modern methods.

The circular, modified circular, and anterior and posterior flap, or racket-shaped incisions, are, however, all popular methods in emergency surgery. The older or transfixion method is now seldom employed.

In order to render the operation bloodless and to plainly distinguish the prominent bleeding vessels, a rubber Esmarch bandage is applied, after elevating the limb, and fixed well above the place of amputation. In the absence of the Esmarch bandage, rubber tubing or an ordinary cloth bandage firmly applied will be sufficient.

In emergency cases the skin may be properly sterilized if kept dry, by means of the application of tincture of iodine. A solution of bichloride of mercury 1:2000, or a 3 to 5 per cent solution of aleresol may be used. After the limb has been properly prepared, the parts above and below the operative place should be sur-

rounded with sterile towels, over which a roller bandage has been placed.

After the flaps have been incised and folded back, the muscles and tissues are divided down to the bone and are then retracted by a suitably placed bandage, and the bone or bones sawed off, care being taken not to splinter or sliver the ends of the bone.

It is optional whether or not a cuff is made of the periosteum, but after the bones have been sawed off, the outer edges should be carefully rounded off by means of bone forceps or file. The arteries and larger veins are then secured and tied with chromicized catgut ligatures. The tourniquet is then loosened, any remaining bleeding vessels picked up and ligated with ordinary catgut. The main nerves are then pulled down and cut short, and hot gauze sponges applied until all oozing ceases.

The hemorrhage arrested, a drainage tube is inserted through and through, or at the most dependent portion of the wound, after which the muscles and tendons are brought in apposition and stitched with catgut. The skin flaps are then brought together with two or three silkworm interrupted sutures carefully placed to hold the skin in position, after which a continuous suture of chromicized gut may be inserted, or metal clips may be employed to hold the skin in exact apposition.

AMPUTATIONS OF THE FOREARM, ARM, AND SHOULDER

Amputation of the forearm is usually made by the modified circular method, with equal anterior and posterior flaps, so that the scar will be directly over the ends of the bone. The flaps seldom have to be more than one and one-half inches long, and hence should be made close to the site of injury, saving as much of the length of bone as possible, as every inch is valuable. In some forms of injury it may be necessary to have a long anterior or posterior flap to secure the best results.

The nerves of the forearm are very sensitive, hence, after ligating the radial, ulna and interosseous arteries, the ulnar nerve which lies near the artery, and the median nerve, should be sought, pulled down, and cut off as short as possible. It is also customary in amputations of the forearm, before sawing the bone, to dissect

up and form a cuff of the periosteum. After removal of the bone, the periosteal cuff is pulled down over the end of the bone to prevent fusion of the cut ends of the bones.

The skin is closed with chromicized gut sutures, a small drainage tube inserted before the wound is closed, and antiseptic dressings applied. The limb is then placed on an internal rectangular

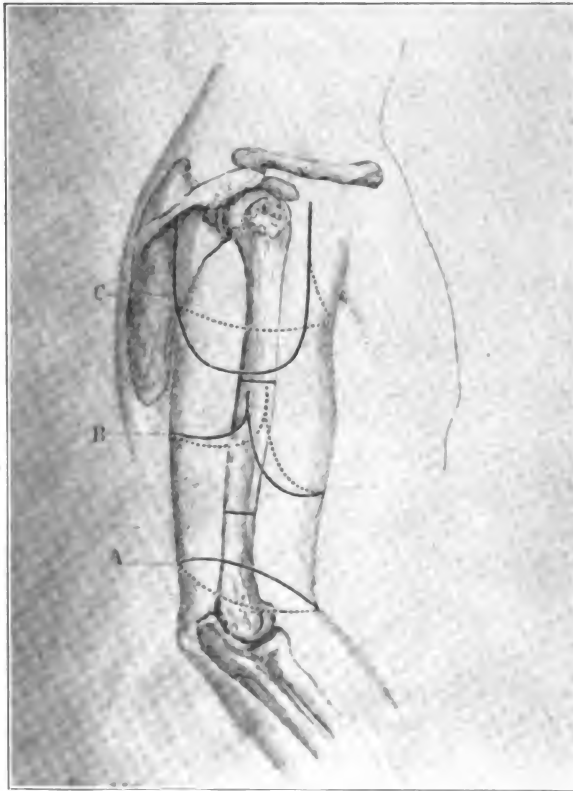


Fig. 237.—Ideal incision for amputation of arm.

splint about half way between pronation and supination, and the arm kept in this position until the wound heals, which is ordinarily within ten days to two weeks.

Amputation of the arm is made practically in the same manner, the lines of incision in ideal amputations being illustrated in Fig. 237.

In emergency surgery, however, as before stated, it is rarely possible to have the opportunity to amputate a limb at any point of election. The surgeon is forced very often to form his flap from any part or section from which he can secure the best covering.

AMPUTATION OF THE WRIST

In amputations of the wrist, it is of great importance, when possible, to save the first row of carpal bones, the whole of the

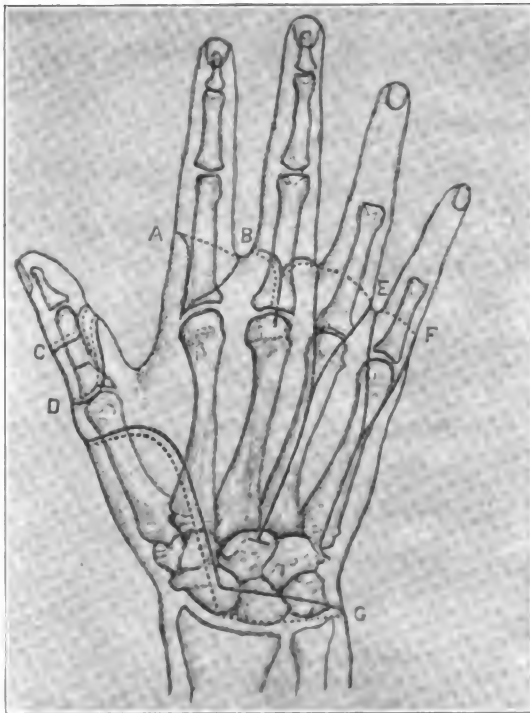


Fig. 238.—Lines of incision for amputations of fingers and wrist.

carpus, and the proximal ends of the metacarpal bones. The flap in many instances may be taken from the palmar surface of the thumb, as illustrated in Fig. 238, or from the palm of the hand.

The after-treatment is practically the same as for amputation of the fingers.

AMPUTATION OF THE FINGERS

The joints can be readily located and outlined by simply flexing the fingers, and with the exception of the distal end or tip of the fingers, the surgeon should always endeavor to save at least a part of the shaft of the phalanx, otherwise he must secure the flexor (and when possible, the extensor) tendons by a stitch to



Fig. 239.—Amputation of thumb.

the sheath or periosteum over the end or front of the bone. It facilitates matters to secure the tendons by forceps before their division, since they may contract within the sheath and much time is lost in securing the cut end. If the tendons are not so fixed, the mobility and subsequent utility of the stump will be lost, and hence, useless.

In amputations through the first phalanx of the index and little finger it is of the utmost importance to save even a small

portion of the shaft, as the smallest stump of the forefinger is of considerable service.

The shaping of the flaps in amputations of the fingers, thumb, or wrist are plainly illustrated in Figs. 238 and 239. The long flap should always be made on the palmar surface.

BUZZ SAW ACCIDENTS

In buzz saw accidents, which usually so horribly mutilate the hand or fingers, every effort must be made to save as much of the hand, as well as fingers, as possible. It is often astonishing how much of the hand can frequently be saved in the worst cases.

Under careful asepsis the shaft of the carpal bones or sections thereof can be replaced or joined together by suture and unite quickly, thus preserving the contour of the palm of the hand and establishing a fulcrum to sustain motion of the fingers. In resecting the distal end or removing the entire second phalanx, care must be taken to find and fasten the ends of the tendons to the fascia or periosteum, as before stated, for without this precaution the motion of extension and flexion of the stump will not be possible. With an Esmarch bandage or constriction above the wound to render the field bloodless, the tendons can easily be located.

All the parts, wound, bones, etc., should be painted with tincture of iodine, followed by a thorough douching with 1:3000 bichloride solution; and, lastly, sulphuric ether will render the parts aseptic.

After-Treatment

The usual antiseptic dressings are applied and held in place with a roller bandage, after which a suitable splint is used to secure rest and prevent muscular contractions. The dressings, unless soiled from drainage, need not be changed for twenty-four hours. If very painful, applications of a solution of boric acid, 20 grains to the ounce of camphor water, may be freely used. After changing the dressings the splint should be reapplied until the wounds have soundly healed.

Amputations of the lower extremities should be so performed

as to give the patient the stump best adapted to wear a useful artificial limb. The surgeon in emergency practice rarely finds it possible to perform a typical Lisfranc, Kocher, Chopart or Pirogoff operation.

Disarticulation of a single toe is easily accomplished, allowance being made for a very liberal flap, partial amputation being re-

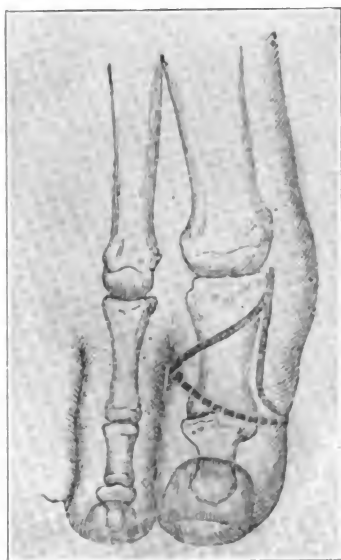


Fig. 240.—Amputation of great toe.

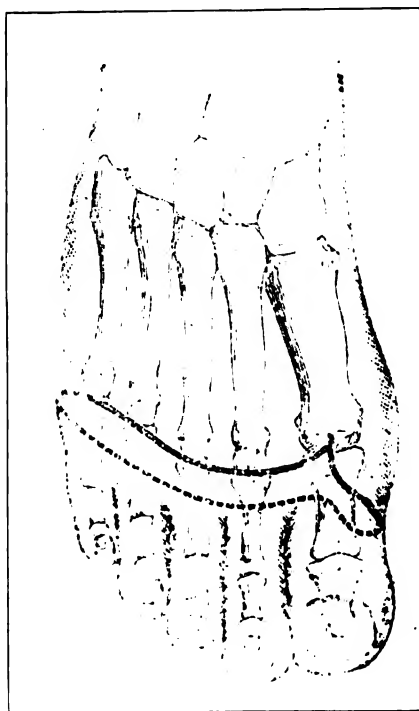


Fig. 241.—Lines of incision for amputation of all the toes.

stricted to the great toe—the long flap being taken from the plantar surface with a short anterior skin flap.

Disarticulation of all the toes is made through the metatarsophalangeal articulation. These joints represent a curved line with its convexity downward, due to the difference in length of the metatarsal bones. The anterior or skin flap is made in the same manner as in amputation of all the fingers (Fig. 238) and

dissected back for half an inch, the exposed tendons divided, and the soft parts dissected back until the joints are exposed. The joints are then opened with the point of the scalpel and the lateral ligaments divided. The plantar flap is then made by dissecting from the base of the phalanges well forward. The hemorrhage being controlled, the flaps are best united by silkworm-gut sutures and dressed after the manner described for amputations of the hand and arm.

Amputation of the great toe is best made after the incision as shown in Fig. 240, or of all the toes as shown in Fig. 241.

Hey's operation, or disarticulation of the four metatarsal bones, is rarely employed in emergencies. Guerin's method of sawing all the bones across gives better results and Syme's method of ankle joint amputation with a heel flap is now regarded as one of the greatest improvements of modern surgery.

Not only is the mortality of this operation very small, but when compared with the stumps made at any other point of the foot or leg, these made at the ankle joint have proved eminently superior and gratifying to the patient; they have been less subject to those untoward complications and sequels, as ulcers, congestions, necrosis, and chronic tenderness, which impair subsequent usefulness with appropriate and well-adapted reparative apparatus.

The operation is performed as follows: Place the foot at a right angle to the leg; enter the knife at the point of the external malleolus, and carry it directly across the sole of the foot to a point opposite. One-half inch below the internal malleolus the posterior tibial artery divides beneath the internal annular ligament into the internal and external plantar arteries; and if the incision extends to the point of the internal malleolus, the vessel may be ligated before division. Join the two extremities of this incision by an anterior incision in a direct line over the instep, so that the cicatrix may come well in front.

In dissecting the posterior flap, place the fingers of the left hand upon the heel, while the thumb rests upon the edge of the integument, and then cut between the nail of the thumb and the tuberosity of the os calcis, so as to avoid lacerating the soft parts, which

at the same time are gently but steadily pressed back until the tendo Achillis is exposed and divided. Disarticulate the foot, and saw off the malleoli-obliquely; leave the articular extremity of the tibia uninjured, for it is better not to interfere with the bone if it is healthy.

There are many methods of modifying the construction of flaps to cover the ends of the tibia and fibula, adapted to the various forms of injury of the soft parts; all coverings, whether from the dorsum or the foot, are useful, and should be preserved for that purpose when the heel flap is wanting.

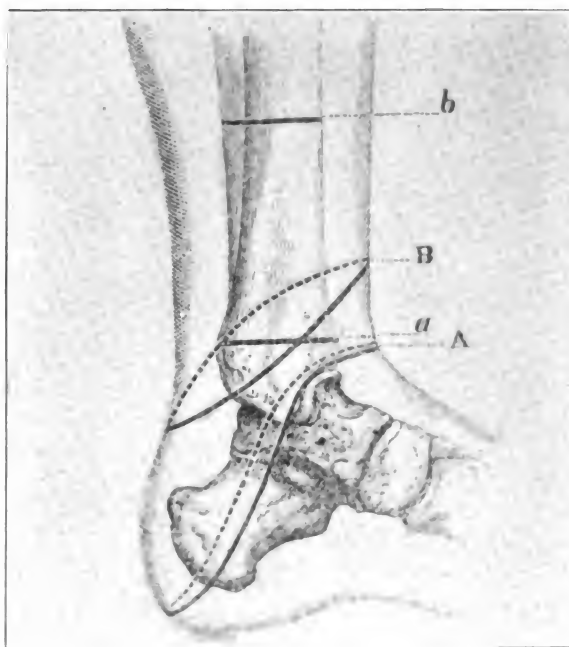


Fig. 242.—Amputation of ankle joint now rarely performed.

AMPUTATION OF THE LEG

Amputation of the leg involves important principles both in operative and mechanical surgery. At no other point is it more necessary to secure a sound and useful stump than in this part. This is due to the incessant use to which it must be applied, and its exposure to injury. But it presents intrinsic difficulties in the

application of the ordinary methods of amputation. This is apparent in the development of the muscles of the calf, the tapering form of the lower portion, and the subcutaneous position of the tibia. The circular flap can not be retracted without dividing it longitudinally; the single posterior flap is of immense size, and is counteracted only by the integument of the anterior part of the

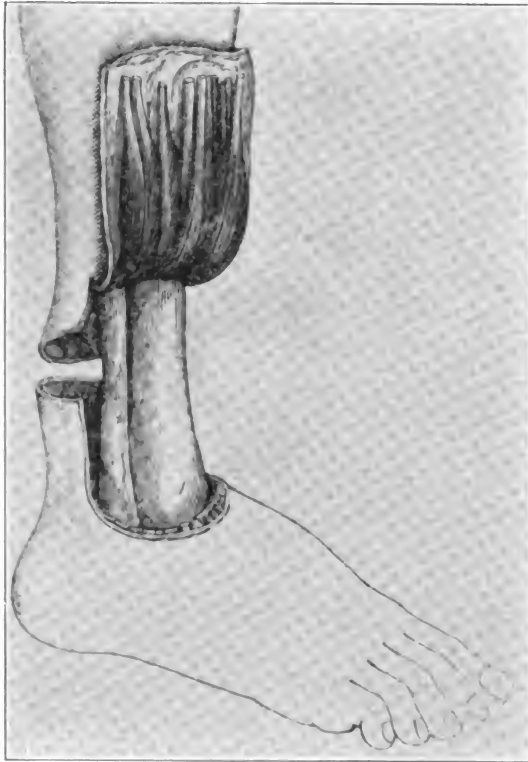


Fig. 243.—Amputation at lower third of leg. Tcale, or hooded, flap.

leg; the double flap gives a great inequality of flaps; the single external flap leaves the crest of the tibia but slightly covered. The results of amputation of the leg at or near the ankle joint have, in consequence of poorly nourished tissue, been more unsatisfactory than at any other point. Necrosis of the tibia, conical stumps, ulcerated coverings, and tender cicatrices have been the rule, when the old methods have been practiced.

Liston in his day also advised surgeons not to amputate the leg at the lower third, but the Teale flap overcame many of the difficulties experienced by the older method, and by means of this method many useful stumps were secured. The most popular

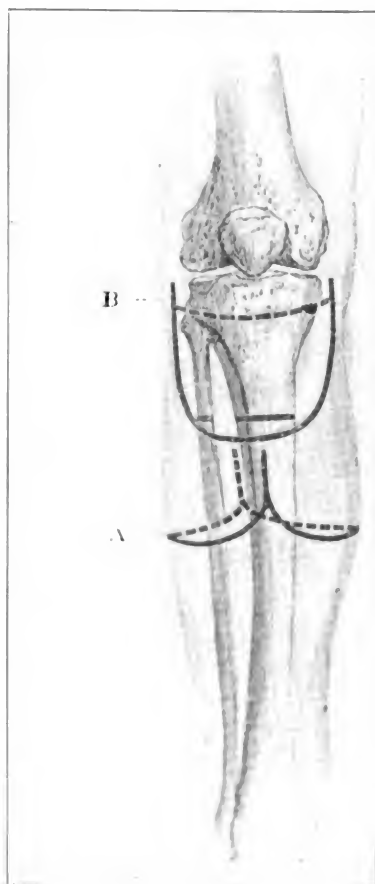


Fig. 244.

modern method of amputating at the lower third is as follows:

A long anterior flap is made by dissecting up the anterior muscles and tissues with the skin, in length and breadth, equal to one-half the circumference of the limb. The posterior flap is made by cutting all the muscles and tissues with a single sweep

of the knife down to the bone. The bones are then sawed off, the edges carefully rounded, and the long flap turned upon itself and sutured posteriorly to the edges of the front flap.

The place of division of the bone, therefore, may be at any point, but the lower part or the commencement of the calf is most favorable for a symmetric stump. If the amputation must be made above the calf of the leg, select a point three or four inches below the patella, which will permit the knee to be bent, and brings the support upon the condyles of the femur. If the amputation must be very close to the joint, disarticulation should be preferred, for the risk to the patient of the knee joint amputation is no greater than of an amputation of the extreme upper third of the leg, while its practical benefits are much superior, as confirmed by experience.

The amputation is performed by making a long anterior skin flap incising the ligamentum patella, turning up the flap containing the patella, opening the joint, and completing the disarticulation by cutting from within outward and downward; or, the amputation may be made by means of a large scalpel, commencing at the center of the anterior surface and carrying it downward along the side of the leg so as to make a slightly curved flap (Fig. 244) with its convexity below. When the incision passes over the prominent part of the leg towards the posterior surface, incline it upwards until the middle of the limb is reached. Make a similar incision on the opposite side. These large bilateral flaps should consist of the skin and superficial fascia; dissect them forward to the extent of one inch in the leg and two inches in the thigh, after which the disarticulation of the joint may be made, or in the lower part of the thigh, the bone removed. The patella should be removed.

AMPUTATION OF THE THIGH

Amputations of the thigh are made in the lower, middle, or upper third. Either a flap or a circular operation may be performed. In the double flap operation the skin incision should be made from without inward, and the muscles should be cut by transfixion, or the flaps having been dissected upward, the muscles

and deeper tissues may be divided by a circular sweep of the knife down to the bone; the tissues are then retracted by a bandage and the bone sawed off as high as possible. Arteries and veins are then ligated and the flaps brought down in apposition.

In emergency practice the open plan of treatment of the

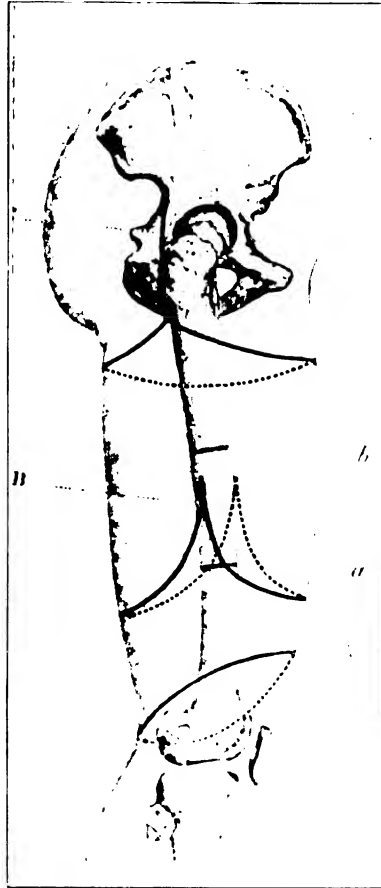


Fig. 245.—Lines of incision for amputation of thigh and hip.

wounds, especially after severe contusion of muscles, is preferable. Two or more large silkworm-gut sutures are inserted at both the outer and inner angles of the wound, the central portion being carefully packed well down to the bone with iodoform

gauze, after which the usual dressings are applied and the limb placed upon a splint in a slightly elevated position. The iodoform gauze packing is removed in from four to six days, the open wound being closed by adhesive strips as deemed necessary.

AMPUTATIONS AT THE HIP

Many surgeons prefer preliminary ligation of the common femoral artery or the external iliac artery; others tie the vessels while making the flaps. Various forms of compression before amputation have been recommended by Macewen, McBurney, and others, but the Wyeth method is still preferred by a majority. His method consists in the preliminary passage of two steel pins. The outer pin is inserted one and a half inches below and a little internal to the anterior superior spine of the ilium (Fig. 246), and is brought out just back of the great trochanter. The inner pin is entered one inch below the level of the crotch and internal to the saphenous opening, and it emerges one and a half inches in front of the tuberosity of the ischium. Sterile corks are pushed on the end of each pin to prevent the wounding of the surgeon's hands upon the sharp points.

Because of the insecurity of the corks Da Costa has had pins made with movable points, and after the pins have been passed through the tissues, the points are unscrewed and knobs screwed on in their place.

After the limb is elevated and emptied of blood thereby, the constricting bands are placed above the pins and fastened, after which the amputation is proceeded with.

The hip is brought well over the edge of the table, a circular incision is made down to the deep fascia six inches below the constricting band, and is joined by a longitudinal skin cut reaching from the band to the level of the circular incision, and the cuff is reflected to the level of the lesser trochanter. The muscles are cut by a circular sweep at the level of the retracted cuff, the capsule of the hip joint is opened freely, the cotyloid ligament is cut posteriorly, the thigh is bent upward, forward, and inward to dislocate the head of the bone, and, using the thigh as a handle, the round ligament is incised and the limb removed. After ligat-

ing the vessels and introducing drainage tubes, the flaps are sewed together vertically. (Da Costa.)

Senn's bloodless method of amputation of the hip was performed as follows: He made a straight incision about eight inches in length in the direction of the long axis of the femur and directly over the center of the great trochanter. This incision reaches about three inches above the upper margin of the great trochanter. The muscular insertions are divided close to

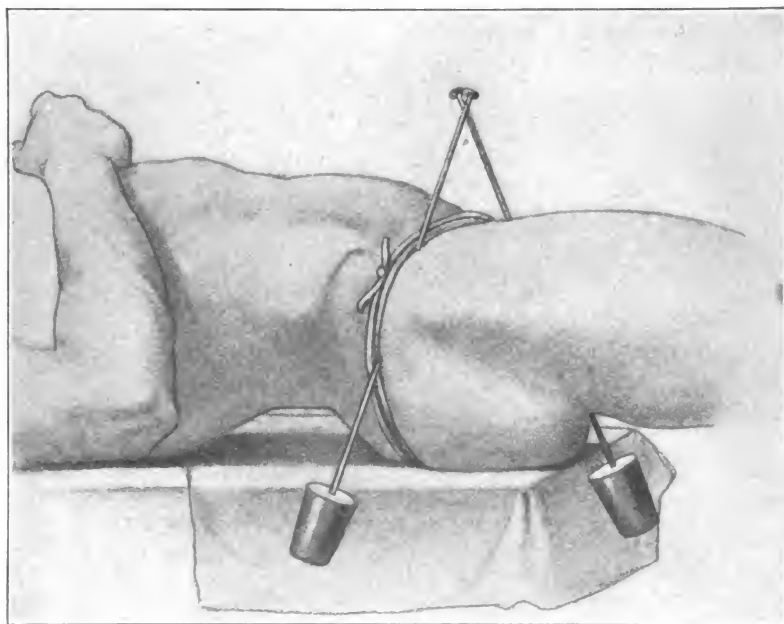


Fig. 246.—Hip joint amputation. Pins and rubber tube tourniquet in position. The Es-march bandage has been removed. (Wyeth.)

the bone, and the thigh is flexed, strongly adducted, and rotated inward. The capsular ligament is divided at its upper and posterior aspect. Then the thigh is dislocated outward and the ligamentum teres femoris is cut. The limb is now brought down in a straight line with the body, the thigh is slightly flexed, a long and stout pair of forceps is inserted into the wound behind the femur and on a level with the normal situation of the lesser trochanter. The instrument is pushed downward and inward two inches below the ramus of the ischium and just behind the adduc-

tion muscles. As soon as the point can be felt under the skin, an incision two inches in length is made upon it, and the instrument forced through the opening. The tunnel in the tissues is enlarged by opening the forceps. A piece of rubber tubing three-fourths inch in diameter and four feet in length is caught about the middle with the forceps and is withdrawn. The rubber tube is cut in two about the point at which the forceps have held it, and half of the tube is used to constrict the anterior segment of the thigh, and the other half to constrict the remaining portion. Before the constricting bands are tied, the limb is held vertically for a sufficient length of time to make it practically bloodless. The amputation is then completed.

CHAPTER X

OBSTETRIC EMERGENCIES

ABORTION

Abortion is seldom if ever an emergency measure, hence the methods of inducing abortion will not be considered here. Artificially induced abortion is either a crime or an unfortunate last resort, and should never be performed except after proper consultation with one or more reputable physicians.

Lepage has drawn the following conclusions relative to the treatment of abortions: "In treating abortion in the early months we must take into consideration whether it has been spontaneous or criminally induced. The prognosis of spontaneous abortion is good if it was not caused by an acute febrile disease. If there is no fever or hemorrhage, the treatment should be purely expectant. If an attempt at criminal abortion is suspected, the delivery of the fetus embryo must be hastened by the administration of quinine sulphate 1 gram per day. If this is not sufficient and fever or hemorrhage sets in, the uterus must be emptied either digitally or by curettage controlled by the finger. In fever after abortion frequent irrigation of the uterus, and drainage should be used. If the adnexa or peritoneum are involved, curettage should be performed immediately. In case of suppuration in Douglas' pouch, colopotomy should be done and drainage inserted. Very rarely are there indications for vaginal or abdominal hysterectomy. Local treatment is generally sufficient if it is begun in time."

If called to a case of abortion when there is, or has been, excessive hemorrhage (and it is to this type of cases that the emergency surgeon is usually called), the attendant should note carefully the appearance and condition of the patient. If there is marked pallor, nausea, and vomiting, thready pulse, cold skin, with faintness or tendency to syncope, or in other words, where the symptoms indicate excessive loss of blood, the patient's head

should at once be lowered, and to facilitate further treatment, the patient should be placed directly across the bed with hips and pelvis as near the edge of bed as possible, with the hips slightly elevated and limbs flexed upon the side, and supported.

A vaginal examination should be rapidly made, and with the finger as a scoop, the vagina should be quickly cleared of all blood clots. The next step is to carefully pack the vagina with sterile gauze. This can easily be done by using two fingers to press down the perineum and extend the vagina, and a long strip of gauze should be then introduced over the fingers with Bernay's probe packer, first carefully surrounding the cervix, after which the vagina is firmly packed; and this should be followed by a T-bandage to hold the gauze snugly in place and prevent further hemorrhage.

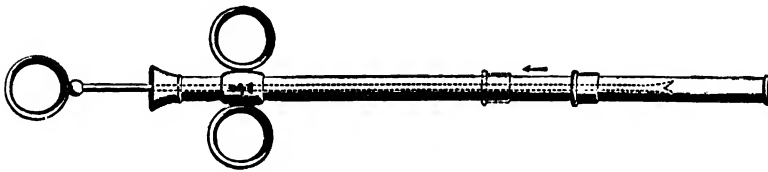


Fig. 247.—Uterine packer.

A pint of hot normal saline solution by rectal enema, should be given, and patient replaced lengthwise of the bed, with the foot of the bed elevated. Hypodermoclysis of six to eight ounces of saline solution at a temperature of about 105° may be administered. Five to ten drop doses of aromatic spirits of ammonia every hour or two may be given with benefit, and frequent sipping of hot water or mild beef tea also tends to rapidly restore the blood supply.

Unless expulsive pains return and forcibly expel the gauze, it may be allowed to remain eight to twelve hours. On removal of the gauze pack, the secundines are often found adhering to the gauze. If not, the cervix is usually patulous and the contents of the uterus may easily be removed with the finger as a curette. If, however, the patient is supersensitive, or very nervous, she should be anesthetized and the uterus carefully cleaned out. A blunt curette or placental forceps may be used to advantage if

very gently employed, but the sterile finger is the best and safest instrument in these cases.

If the cervix is not patulous or open, there are two methods of treatment commonly practiced; first, to forcibly dilate the cervix and use the curette; and second, the conservative method of waiting. It is the experience of the author that the conservative method is much the better, and the safer.

If the cervix will admit of the introduction of a small uterine packer, a strip of iodoform gauze is inserted and the uterine cavity gently packed, and as the packer is withdrawn the rest of the gauze strip is left to remain in the vagina. Twenty- to 30-drop doses of ergot are given by the mouth every three or four hours until expulsive pains ensue, which usually occur in from six to twelve hours, resulting in the final expulsion of the entire uterine contents or rendering the cervix sufficiently patulous to admit of the removal of the contents without injury to or laceration of the mucous membrane.

Should infection follow, it should be treated on good surgical principles by means of intrauterine irrigation and antistreptococcic serum.

RETENTION OF THE PLACENTA

Maternal Dystocia.—The causes of retention of the placenta are: first, adhesions that prevent the loosening or detaching of the placenta, which should occur normally after the expulsion of the child; second, atony or inertia of the uterus, failure of the uterus to properly contract during the third stage of labor; and third, contraction of the external os, hour-glass or tetanic contraction of portion of the uterus—the so-called Bandl's ring—which practically incarcerates or walls off the placenta; or lastly, some malformation of the uterus, growth of tumor, which prevents or interferes with the normal contraction of the uterus.

It is a mistake to assert that this complication may usually be prevented by the proper management of the second or third stages of labor, and while it may be, and possibly is true, that the reckless employment of ergot or pituitrin may complicate matters and cause malcontraction of the uterus following delivery of the child, nevertheless, this accident will happen despite the most

diligent applications of the Credé or any other known method of treatment, and does occur despite all precaution, and through no fault of the accoucheur. The author has met with a number of cases in premature births, delivery taking place at a time when nature was not fully prepared for the ordeal, and it is in this class of cases that this complication is mostly to be expected.

Diagnosis

The retention of the placenta within the uterus can best be determined by digital examination, with the cord as a guide. Inability to feel or locate the edge of the placenta at the internal os, and the nonappearance of the placenta after vigorous contraction of the uterus, as well as the peculiar shape of the uterus, would indicate adhesion, and the absence of hemorrhage would signify complete adhesion. In the absence of pain and hemorrhage the Credé method of compression or kneading of the fundus and by encouraging the patient to make voluntary bearing-down efforts at expulsion, will in a great many instances suffice to bring the placenta within reach; but in the presence of profuse hemorrhage, the indications are to empty the uterus by the quickest possible means; and should the Credé method fail, manual extraction under proper aseptic precaution and anesthesia should be attempted.

"With the patient in the lithotomy position, the hand is carefully passed into the vagina and any constriction of the os may usually be overcome by gradual dilatation with the cone-shaped hand. Should the placenta be found free in the uterine cavity, it is simply grasped and removed. If adhesions are present, the placenta is best separated by peeling it off by means of the fingers from above downward." (Edgar.)

If the hour-glass or internal constriction can not be overcome by the fingers as suggested, and the placenta is incarcerated above the constriction, the uterus should be drawn down and gently held by vulsella forceps as near the vulva as possible, without forcible traction.

Goodell's or some good dilator should be introduced and the constriction gently overcome, after which, the placenta may be removed by the fingers or assisted by a large blunt curette. Great care must be employed not only not to injure or perforate the

uterine wall, but to completely remove all placental tissues. Following this the uterine cavity should be freely irrigated with hot saline, or a 1 per cent creolin solution. Should the hemorrhage persist after emptying the uterus, the uterine cavity should be packed with sterile gauze as suggested in the treatment of post-partum hemorrhage.

CESAREAN SECTION

Cesarean section is distinctively an operation of emergency. The indications, therefore, can not be governed by any absolute rule. All the circumstances must be considered and each case decided upon its own merits.

With a pelvic measurement of but two and a half inches, in the conjugate diameter, the operation is absolutely indicated in the interest of the child as well as the mother. Craniotomy or embryotomy are now almost obsolete, since the death of the child is imperative, and the risk of the mother is greater than in Cesarean section, which operation makes it possible to save both mother and child. The other indications for Cesarean section as now agreed upon are: ovarian tumors, or tumors of the pelvis causing obstruction to delivery; certain cases of eclampsia and placenta previa; in kyphosis, accidental hemorrhage within the placenta, and fetal dystocia, where it is found impossible to deliver the child, even after embryotomy.

Time of Operation

All modern surgeons agree that the proper time for operation is eight and a half months gestation where the viability of the child is assured, and before actual labor commences.

Prognosis

Where the fetus is strong and vigorous, and the mother is in fairly good condition, we can usually assure the patient of her prompt recovery, and the child will also very probably survive. But to defer the operation until the patient is so exhausted from her efforts at expulsion, anxiety, hemorrhage, and exposure to

sepsis that she has little or no recuperative powers, is wrong. Hence, delay always increases the mortality or death rate.

Abdominal Cesarean Section

In emergency cases every effort must be made to secure asepsis, but instead of the usual washing and scrubbing of the abdomen, tincture of iodine freely applied will answer every purpose. The incision is made in the median line (Fig. 248) five or six inches

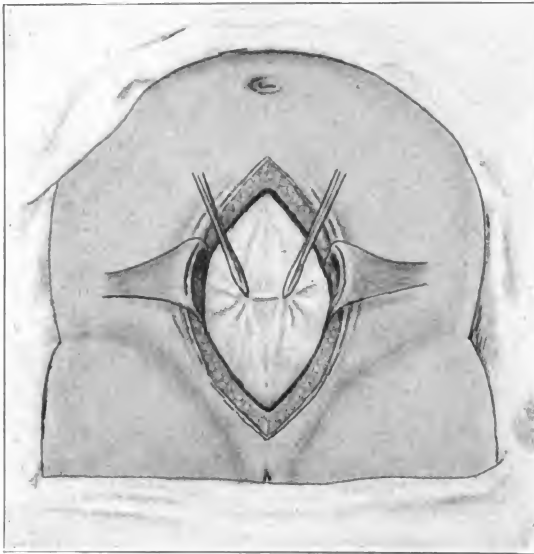


Fig. 248.

in length, or may be made from the pubis to an inch or two above the umbilicus. If the fundus of the uterus is very high, the umbilicus should be about the center or middle of the incision.

After opening the abdomen, there are two methods of procedure; first, to deliver the fundus of the uterus through the abdominal incision, protecting the peritoneal cavity with properly placed sterile towels, or second, the abdominal cavity is carefully protected by the insertion of a large continuous gauze pad, and the uterus is held close up to the abdominal incision by an assistant.

The incision into the uterus is now to be made rapidly down through the membrane in the median line, five or six inches in length. If the placenta is met with, it is separated gently, pushed

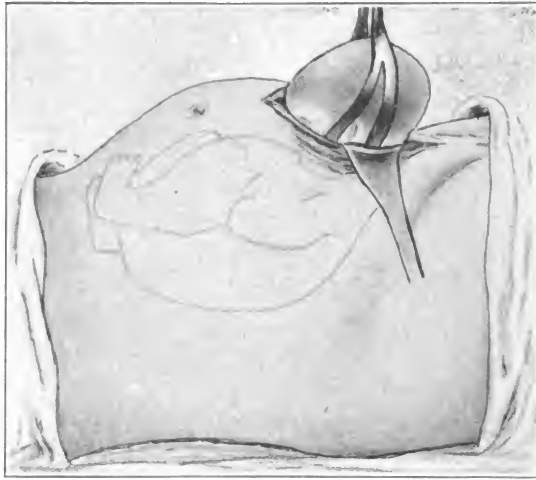


Fig. 249.

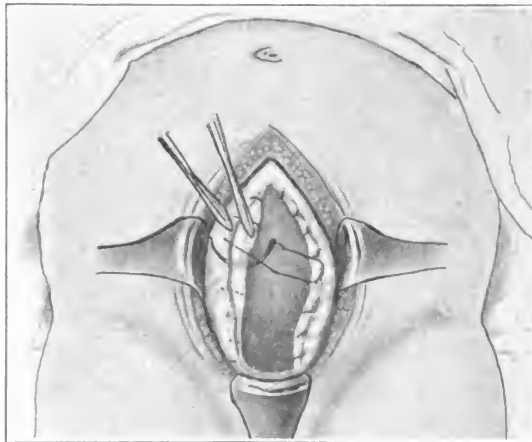


Fig. 250.

to one side or bored through with the fingers, never incised. The membranes are now ruptured and the child seized by the foot or the head by forceps and carefully extracted. (Fig. 249). The

hand in the uterus should not be withdrawn until delivery is completed, as the uterus contracts rapidly after the liquor amnii has escaped.

Any incarceration or lodgment of the fetal head in the pelvis may be overcome by the fingers with the aid of properly directed traction of the fetal body.

The placenta frequently lies loose within the uterus after delivery of the child, but, if not, it should be grasped and squeezed like a sponge, and with gentle traction the mass soon loosens or peels off, and may be removed *en masse*.

The uterus is now closed usually with three layers of sutures. The first or inner aspect should be accurately approximated by a running or continuous No. 2 chromicized catgut suture (Fig. 250). Usually in the second layer, interrupted sutures are inserted from the external aspect of the uterus down through the entire thickness of the muscular walls, using No. 3 or No. 4 chromicized gut, and tying of these usually suffices to control all hemorrhage. A superficial suture of very fine catgut is now used to unite the peritoneal covering of the uterus, following which the abdominal wound is closed, after the usual manner, drainage taking place naturally through the os.

Extraperitoneal Cesarean Section

The method advocated by Dr. B. T. Hurst, of Philadelphia, is performed as follows: "The lower abdomen is incised down to the symphysis pubis; the parietal peritoneum is opened in the usual manner; the lower visceral peritoneum and the lower uterine segment are opened in the same manner. The two peritoneal flaps are now sewed together on each side, thus closing the peritoneal cavity. The lower uterine segment is incised from above downward, as low as necessary to deliver the child, the bladder being protected by a retractor over the symphysis. A forceps is applied to the child's head, and the placenta and membranes are removed.

"The uterine wound is united by a two-tier catgut stitch; the double peritoneal flaps are brought together in the middle line over the uterine wound by two or three interrupted stitches, and the abdominal wound is closed in the usual way."

Vaginal Cesarean Section

Vaginal Cesarean section is not applicable to cases of pelvic deformity, but is highly extolled in certain cases of eclampsia and placenta previa, complicated by stenosis of the cervix, where rapid delivery is indicated and the condition of the cervix renders rapid dilatation dangerous or impossible.

Maternal cardiac disease, exophthalmic goiter, complicating pregnancy at full term, are said to be conditions often requiring vaginal section. The technic of the operation is as follows:

After proper sterilization of the local parts, the patient is placed in the usual dorsal position with the limbs flexed. The perineum is depressed with a broad, flat speculum and the cervix seized on each side by tenaculum forceps and drawn downward and backward into the vulvar outlet. A transverse incision of one and a half to two inches is now made at or about the uterovaginal junction, through the vaginal wall. The bladder is now stripped upward by a blunt dissection until the point of deflection of the peritoneum is reached. A long retractor is now inserted which protects the bladder and exposes to view the cervix and lower segment of the uterus. An incision is now made in the median line of the cervix internal os and well up into the lower segment of the uterus, by means of a strong pair of straight, blunt-pointed scissors. This incision may be still further stretched by means of the finger, and with one hand inserted through the vagina, the child is delivered by version or by means of forceps as seems indicated. After delivery of the child and placenta, the incision in the internal cervix and vaginal wall must be carefully closed by catgut suture. The bladder should be emptied by catheter, and a mild vaginal antiseptic douche should be employed to prevent sepsis.

PLACENTA PREVIA

The placenta is said to be previa when it is attached to any portion of the lower segment of the uterus, so that dilatation of the segment causes unavoidable hemorrhage. Any hemorrhage from the uterus during the last three months of gestation indicates premature detachment of the portion of the abnormally inserted

placenta. The form of the several varieties of placenta previa may be arranged in two groups: first, complete, or centralis, where the placenta completely covers the lumen of the os, fortunately quite rare; second, the incomplete marginalis, or lateralis, where the placenta is attached to one side or the other, or does not reach beyond the margin of the internal os.

Symptoms

The principal symptom of placenta previa is hemorrhage, and the more nearly central the placenta is attached, the earlier will the occurrence of severe hemorrhage take place. Where the placenta is attached in the marginal variety, little hemorrhage may be expected until the beginning of labor. In the other varieties, while the hemorrhage occurs most frequently during the last month, it may be expected any time after the sixth month. Therefore, hemorrhage occurring during the last months of pregnancy is always significant, and enables the attendant to recognize the probable nature of the case at a period sufficiently early to adopt precautionary measures with a view to the mother's safety. From the commencement of labor the symptoms of the various varieties of placenta previa are identical. The hemorrhage occurs with little warning and becomes so profuse that it endangers the life of the patient. Again, the hemorrhage may be intermittent in character, each succeeding pain tending to further separation of the placenta from its cervical attachment, causing the increase of hemorrhage.

Prognosis

The prognosis in placenta previa is always grave. The death of the mother is due to either hemorrhage or sepsis, and the nearer full term approaches, the better is the prognosis. The more central the placenta is attached, the greater the danger to both mother and child; and lastly, the greater the hemorrhage before actual labor begins, the greater the risk, since the woman in her anemic condition from lack of blood is less able to bear operative or mechanical delivery, and sepsis resulting therefrom is far more liable to occur, however great the precaution to prevent it, owing

to her low resistive powers. There is usually more hope for the child than is commonly admitted at full term.

Treatment

Induction of Premature Labor.—Many surgeons contend that the induction of premature labor before viability of the child is usually necessary, and with some religious sects or denominations the child must be given the preference or right of survival over the mother. The author has but little patience with those who recommend expectant treatment, but has always contended that after due consultation and carefully explaining the danger and risk to the mother and friends, the mother should be given the right of decision as to whether or not the pregnancy shall be terminated. "If, therefore, the condition is recognized prior to the seventh month, and the pregnancy is allowed to continue, the patient should be taken to a hospital or placed where she can have the constant presence of a competent attendant; otherwise the uterus should be emptied as soon as possible after the diagnosis of the condition is positively named." (Edgar.)

ESSENTIAL FEATURE IN THE TREATMENT OF HEMORRHAGE

If, when first seen, the patient is in a condition of impending collapse from excessive hemorrhage, an effort should be made to tightly tampon the cervix and vagina with aseptic gauze and then make every effort to bring about reaction with hypodermoclysis, hot saline enemas, and stimulating drinks, frequent sips of hot water or tea, etc., before resorting to operative measures. The foot of the bed should also be elevated and the patient kept as quiet as possible. Ample assistance should then be summoned, and family be informed as to the probable critical condition. The presence of the tampon properly applied not only tends to control the hemorrhage, but rarely fails to induce active labor. When reaction occurs and the patient is stronger and labor pains make their appearance in sufficient force to expel the tampon, rapid dilatation of the cervix should be the next procedure. This may be accomplished by Goodell's dilator and as soon as the cervix is sufficiently dilated to admit two fingers, the thumb of each hand should be introduced and bimanual dilatation resorted to, by

which method we may rapidly complete the dilatation sufficiently to at least bring down a leg (Braxton Hick method of combined version), and the breech or body of the child acting as a tampon will tend to control further hemorrhage. If the head of the child presents in the lower segment of the uterus, it may be usually grasped and removed with the aid of the obstetric forceps.

After delivery of the placenta the vagina should receive a thorough douching of a mild solution of bichloride of mercury, after which the foot of the bed should be elevated, stimulants administered by the mouth, with caffeine or sulphuric ether hypodermically. Vomiting, which is usually present, may be controlled by repeated doses of $\frac{1}{10}$ grain of calomel, and cracked ice and nutrient enemata are of great benefit.

VAGINAL CESAREAN SECTION

Placenta previa, as well as eclampsia, owing to the high fetal and maternal mortality, has been regarded as a fit subject for Cesarean section, which operation is described under its proper heading.

MECHANICAL OR FORCEPS DELIVERY

The modern obstetric forceps consists essentially of a pair of steel blades with long or short fixed handles. The blades having double curve, cephalic and pelvic, and are intended to clasp the fetal head and enable the operator to extract the child in certain cases of difficult labor, when the natural powers are inadequate to expel it. Of the numerous forceps or models now in common use in this country, the most prominent are known as the Simpson, Hodge, Barnes, Wallace, McLean, Tucker, etc. Of these the Elliott modification of Simpson is possibly the most popular, and, with the Tarnier axis-traction forceps, is usually considered all that is necessary by way of forceps to the average obstetrician. In the hands of an ordinarily careful operator, who is versed or familiar with the anatomy of the pelvis, and the mechanism of labor, the obstetric forceps is a safe and reliable adjunct, equivalent to, or on a par in importance, with the administration of ether or chloroform, in properly selected cases of parturition.

Functions of the Forceps

The essential function of the obstetric forceps is traction. In the language of Jewett, "the obstetric forceps is intended solely to assist, replace, or to supplement the natural expulsive forces." Its use as a compressor, lever, or rotator is seldom justifiable and is always attended with more or less danger to mother and child.

Essentials to Forceps Delivery

1. A dilated or dilatable os. (In emergency cases resort may be had to manual or forcible dilatation or multiple shallow incisions of the lower border of the cervix.)
2. The head of the fetus must be of normal size or compressible to a normal degree.
3. The pelvis must be nearly normal in dimensions.
4. It is always desirable that the fetal head shall be at least engaged in the brim of the pelvis or descended far enough to become fixed.

The ideal condition for forceps delivery is, therefore, a fully dilated cervix, a large, roomy pelvis, and relaxed perineum, with low engagement of a normal head in a normal pelvis. But, unfortunately, such ideal conditions are not often present, and, therefore, the operator must endeavor with patience and skill to bring about as nearly normal conditions as possible before resorting to mechanical assistance.

Many of our best authorities reject delivery by forceps, in favor of version, where the head is not engaged. The old rule, "Version before, and forceps after engagement," is good theory, but not always good in practice. Cases are not uncommon where the amniotic fluid has drained away with practically no engagement of the fetal head, the child being firmly invested by the uterus, the patient much exhausted, and where version would be a difficult, as well as dangerous, procedure. In such cases it is often advisable to place the patient under anesthesia and by careful bimanipulation, gradually press or force the fetal head down within the brim of the pelvis and have it held there until the forceps can be applied with little risk, at least to the mother.

The Tarnier and other axis-traction forceps are employed in

cases of eclampsia or in cases where it seems imperative for a speedy delivery, and especially where there is reason to believe the fetus is not alive. In skilled hands this forceps may be of great value, possibly indispensable, but in ordinary hands it usually means death to the unborn babe and should only be used in emergency cases.

Indications for Forceps Delivery

This is a somewhat mooted question and open to discussion and honest difference of opinion.

The necessity for forceps delivery may be classed as major and minor. The major cases may more properly be considered complications of labor, of which the most prominent are hemorrhage, eclampsia, fetal dystocia, prolapse of the funis, and all cases and conditions where immediate delivery is essential to the life or welfare of the mother and child.

The minor cases may be indicated by exhaustion of the mother from prolonged labor, or effects of slow, cervical dilatation, uterine inertia, or where for any reason the pain ceases and the head being well down within the pelvis, further progress is arrested, the mother becoming anxious, despondent, nervous, unstrung, and exhausted. It is then that the forceps gently and skillfully applied under anesthesia, will bring quick and safe relief to both mother and child.

In many cases, especially primiparæ, in an otherwise normal labor, the fetal head is often retarded or arrested in its passage through the inferior strait, or may lodge at the rim or outlet of the pelvis. It is exceedingly aggravating to the sufferer, and if after one-half to one hour, despite powerful uterine contraction and strenuous muscular efforts on the part of the mother, the head remains stationary, it is not good practice to withhold instrumental assistance until collapse is imminent. Should the mother's pulse rise to 120 or 130, it is a reliable symptom of rapidly approaching exhaustion or collapse—symptoms which always justify mechanical assistance.

Dangers Attending Forceps Delivery

The risk in forceps delivery is far greater to the child than to the mother. To compression of the fetal head by the forceps

blades is attributed the greatest mortality, the most common results of undue compression being intracranial hemorrhage, meningitis, hemiplegia, psychic disorders, and epilepsy later in life. The anterior angle of the parietal bones is supposed to be the most vulnerable point on the fetal cranium. Injuries to the brachial plexus, abrasions, indentations, lacerations and contusions of the scalp, face, and eyes, are not uncommon after hasty or careless instrumental deliveries. This is not to be wondered at when one remembers that all modern forceps are so constructed that when placed in position over the fetal head there is no mechanical contrivance to prevent undue pressure to the head, and it is but the natural law that where the blades are opened and not fixed, the stronger the traction the greater the tendency to press the handles together, and serious compression is often unconsciously inflicted by the operator. The most common injury to the mother and by many often considered unavoidable, are lacerations of the cervix or vaginal walls, and rupture of fourchette or perineum. Undue compression, therefore, of the head of the child is admitted to be the great source of danger in all forceps deliveries, often unintentionally and unavoidably done, with the ordinary long, heavy steel forceps, especially in the making of strong or forcible traction.

Other Essentials to Forceps Delivery

It is also essential to a successful and safe forceps delivery to know the exact position or presentation of the fetal head. It is not always possible to fix or base the diagnosis on the fontanelles. In case of the slightest doubt, it is a very simple matter, as suggested by Prof. Wm. H. Taylor, of Cincinnati, years ago, to pass the finger around or over the occiput until you find and locate an ear. If this procedure is followed, there will be few mistakes. This examination can best be made under anesthesia, and any attempt to adjust or deliver with forceps without anesthesia savors more of brutality than good common sense. In applying forceps it should never be forgotten that traction in the median line with forceps adjusted transverse to the pelvis is never a safe procedure, and rarely called for. The instrument should always be applied and traction made in the direct line of descent, that

is, tilted to the right or left in accordance with the presenting position.

The blades are introduced singly. If the operator is right handed, the right blade should be placed first, and follow the index and middle fingers as guides until they gently encircle the head of the child. The two fingers of the left hand should then be inserted, pressing the tissues aside, and the left or upper blade introduced, following the palmar surface of the fingers as a guide, until the blade encircles the opposite side of the head. The handles are then carefully closed.

Very strong traction without apparent progress is positive evidence either that the forceps are not properly adjusted in respect to the fetal head, that traction is possibly being made directly against the rim of the pelvis, that possibly the fetal head is abnormally fixed, or that the pelvis is contracted; all of which must be carefully considered before applying undue force. Simply placing the patient in the English position, on her right side, often facilitates delivery by changing the line of traction. Strong traction to such an extent as to cause repeated slipping of the blades from the head of the child is not good surgery, and self-evidence of improper adjustment of the forceps blades. Up and down or seesaw motion of the forceps is mentioned only to be condemned as absolutely unsafe and dangerous to the mother. A gentle swaying side to side motion is often of great benefit.

Undue exposure of the mother at any time during her confinement is uncalled for. It seems popular in some of our eastern clinics, but, nevertheless, it is a revolting custom of foreign invasion, indecent, immoral, disrespectful, and unpardonable; a practice which tends to destroy the privacy, the purity, and the sanctity of motherhood. The operator has nothing to gain from ocular inspection, and, except possibly in very difficult high or major operations, no exposure is necessary in the introduction or adjustment of obstetric forceps.

Modern Obstetric Forceps Mechanically Considered

Before commencing this phase of the subject, the author desires by way of preface, to say that operative obstetrics as practiced in our large eastern hospitals and cities, is a very different

matter than the practice of obstetrics in our small towns or country at large. In the hospital or city practice there is every convenience, the patient is placed on a solid slab or table, easy of access, there are at command able and trained assistants, and

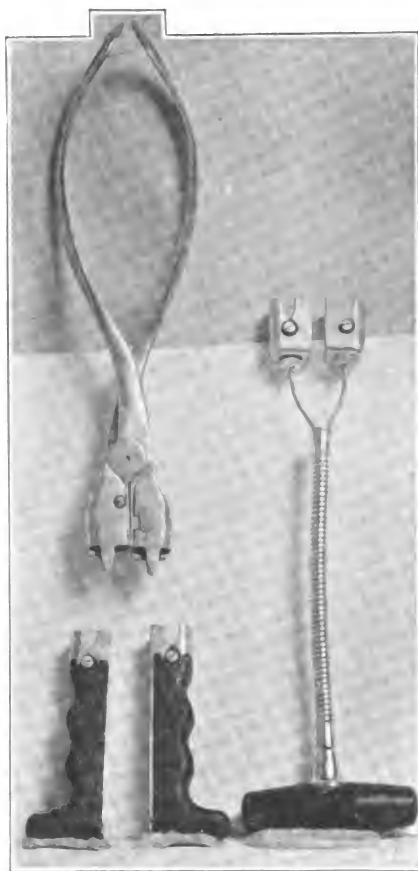


Fig. 251.—The Morse forceps.

no home folks are admitted. In private or country practice the operator is thrown wholly upon his own resources, with willing, unskilled, but critical assistants. The patient is usually confined on her own cot or bed, a swaying woven-wire mattress or spring bed, and the average mother, husband or friends will very strenuously object to having the patient removed or placed on a table.

Unfortunately for the mechanic, all fetal heads are not the same size. Hence in the manufacture of obstetric forceps the average head, or, more correctly speaking, the average pelvis, must govern the size and curve of the forceps.

For a number of years the author has been engaged in the effort to remove some of the objectionable features of the modern forceps which may be described as follows:

The total weight of the long forceps constructed of a combination of aluminum and steel is eight and one-half ounces. There are many cases where a short forceps can be used to great advantage. By removing the handles, we have at hand a very short forceps, and the weight is reduced one-half. Again, when the blades are placed over the fetal head, any desirable pressure can be made and the lock or bolt will hold them in any position, and this fixation prevents the slipping of the blades and the possible injuries incident thereto. Another important feature of special interest is the fact that it is impossible to lock the blades when placed in apposition, until the width or spread of the blades are closed sufficiently to pass through a normal pelvis. Therefore, if the blades are placed over the head of the child and can not be closed sufficiently for the lock to engage, it is conclusive evidence that the forceps are not properly adjusted or the head is abnormal in size.

Principles of the Morse Forceps

1. An automatic lock or adjustable bolt to fasten or hold the forceps blades after they have been placed in operative position.
2. Detachable and interchangeable handles.
3. An interchangeable and attachable, flexible handle, for double and axis-traction.
4. A simple, safe, and quick method of releasing the forceps at any time in any position.

INVERSION OF THE UTERUS

By inversion is meant the uterus is partially or completely turned inside out. The accident is extremely rare and occurs, strange to say, most commonly in primiparæ, and is supposed to be

caused by paralysis of the placental site and too strong pressure over the fundus in extracting the placenta. It also occasionally occurs in rapid delivery.

Symptoms

The chief symptoms are shock, acute pain, and hemorrhage, with indications of collapse, pallor, cool skin, and rapid pulse, during which fatal syncope may occur. A number of cases have been reported where there were little or no alarming symptoms, nor was the difficulty discovered until some time after its occurrence. The absence of the fundus and peculiar cup-shaped condition of the uterus, the character and appearance of the tumor, aided by a rectal examination, will tend to make the diagnosis positive, especially after the patient has been catheterized.

Treatment

If the placenta has not been detached it should be carefully removed under anesthesia. By careful manipulation, with the hand or fist pressing directly upon the inverted fundus, with counterpressure over the abdomen, the uterus may often be returned to its normal position. After reduction, the uterus should be packed with sterile gauze moistened with vinegar or acetic acid. Ergot should be given and the child allowed to nurse, to stimulate contraction. Should all attempts at manual reduction fail, it may become necessary to perform a vaginal hysterectomy.

In all acute cases, manual reposition should be tried, under anesthesia. If undertaken early, this procedure is successful. If it fails, repositors, etc., may be used, but only for a short time. If these are unsuccessful, one should resort to some operative method at once, the one of choice being colpohysterotomy. This operation stands preeminent in the treatment of difficult cases of uterine inversion, on account of the facility of its performance, and its success in accomplishing the reduction of the inversion, and also because of the practically complete absence of any mortality. The uterine incision should be made at first through the cervix only, and later be extended as far into the corpus as necessary to accomplish reposition.

POSTPARTUM HEMORRHAGE

It is a grave error to suppose that true postpartum hemorrhage is necessarily the result of carelessness or faulty technic in delivery. It may result from uterine fibroma, a diseased condition of the uterine walls, or various constitutional disturbances; accompanied by debility or exhaustion, and especially in cases of uterine inertia or so-called atony, which so commonly follows over-distention of the uterus in twin pregnancy or superabundance of amniotic fluid, with or without prolonged difficult labors; and, lastly, postpartum hemorrhage is liable to occur in those who give a previous history of atony or possess a hemorrhagic diathesis. True postpartum hemorrhage occurs only from the placental site. It is termed primary, or immediate, when it occurs from one to twelve hours following labor; secondary, or remote, when it occurs after twenty-four or thirty-six hours following the birth of the child. Postpartum hemorrhage is also termed internal, or concealed, and external, or open. Severe postpartum hemorrhage may also occur from a ruptured cervix. Bleeding from a uterine artery may be such as to rapidly exsanguinate the patient.

Symptoms

Profuse flooding may come on insidiously, and after a normal or easy delivery, with little or no warning. The patient suddenly expresses herself as feeling faint or dizzy. Such a warning must never be disregarded. There may be little or no discharge from the vagina, but upon grasping the fundus, the uterus will be found soft, flabby, and enlarged, or it may not be possible to palpate or locate the uterus. Again there may be alternate contraction and relaxation of the uterus, in which case the flooding from the vagina is intermittent, profuse, and alarming. In extreme cases the hemorrhage may be so profuse as to cause death in two or three minutes. In concealed hemorrhage, the symptoms of shock and collapse and enlarging of the uterus render the diagnosis plain, the pulse rate and quality being valuable danger signals.

Treatment

Where the patient is rapidly approaching a condition of collapse, gasping for breath, sighing, yawning, etc., symptoms all

recognized too well, although there be no external hemorrhage, but a large relaxed, boggy uterus, quick, precise action is required. The author recognizes but one method of procedure: the left hand must be inserted quickly into the uterus, all blood clots and debris quickly and thoroughly removed. At the same time the right hand on the outside of the abdomen presses upon and kneads or massages the fundus to secure rapid and firm contraction.

Should this means fail, as it occasionally does, with an assistant to hold and press the fundus, the left hand still remaining in the uterus, the tip of a fountain syringe or douche bag should be inserted well into the uterus and the uterine cavity thoroughly douched with hot water as hot as can be borne, acidulated with a little vinegar. A quart or more should be used, which rarely fails to produce contraction; but should this method fail, the uterine cavity should be rapidly but carefully and fully packed with sterile gauze (three to five yards may be used in packing the uterus and vagina), and as long as it remains, it will mechanically control the bleeding and stimulate contraction. The gauze is usually expelled by the forcible contraction of the uterus, but if not, should be removed in six to eight hours, and if necessary, the uterus repacked. Ergot should be given hypodermically, and it is often found necessary to continue to massage or knead the fundus for several hours to keep the uterus in a state of contraction. Should the source of the hemorrhage prove to be from the cervix or a vaginal tear, easily noted by the commencement of the hemorrhage immediately after delivery and continuance of the hemorrhage after firm contraction of the uterus, it may be controlled by tamponing the cervix for a short time, or the bleeding points may be exposed by means of a speculum, and acupuncture or ligature applied.

The hemorrhage controlled, the most active treatment may be required to restore the patient, if the hemorrhage has been very profuse. The foot of the bed should be elevated, the patient surrounded by artificial heat, and kept as quiet as possible. Much valuable time may be lost in attempting transfusion or intravenous administration of saline solution, owing to the difficulty in finding the collapsed veins, and hypodermoclysis in not too large a quan-

tity, with proctoeclysis or high colon enemas of normal salt solution usually prove sufficient and effective. Frequent sips of hot water, tea or coffee, are grateful and stimulating to the patient, and as soon as reaction is established, beef or mutton broth, beef juice, or hot malted milk may be substituted.

UTERINE HEMORRHAGE IN YOUNG GIRLS

Uterine hemorrhage in young girls soon after puberty is not uncommon, and may be so profuse as to cause profound exhaustion and anemia. It is usually attributed to some constitutional or general condition which causes a primary or secondary irritability of the vasomotor system. Some writers believe it due to malnutrition or faulty metabolism, forming a toxin which interferes with the coagulability of the blood.

Treatment

The treatment of excessive hemorrhage from the uterus in young girls should be based upon the causes leading thereto. In the absence of any local cause, failure of development, fibroma, or malposition of the uterus, the patient during the attack should be placed in the recumbent position and kept free from excitement. Coagulose, horse serum, pituitary extract with or without ergot, have been given hypodermically with marked benefit, and later tonics and restoratives, aromatic sulphuric acid 20-drop doses well diluted, calcium chloride, and a vegetable diet, will prove curative. Local treatment, curettement or tamponage, should not be employed unless all other measures fail to afford relief.

RUPTURE OF THE UTERUS

Rupture of the uterus is a rare accident and usually results during labor, in consequence of some obstruction to the expulsion of the child, dystocia, or malposition, pelvic contraction, or diseased condition of the uterus preceding violent contraction. The site of the rupture is usually on the left side and the body of the uterus is seldom torn, the accident being more common in multipara.

Symptoms

Symptoms of rupture of the uterus are usually characteristic. With a startled cry the patient complains of a sharp, acute or tearing pain, which is immediately followed by a state of collapse, symptoms of internal hemorrhage, shock, nausea and vomiting, and the ceasing of all efforts at further expulsion or contraction of the uterus.

Cases have been reported where there was extensive rupture without symptoms of collapse, or where collapse did not occur until after delivery. The hemorrhage may be external or internal, and all writers agree that in proportion to the severity of the hemorrhage will the symptoms be grave. The diagnosis may be confirmed by physical examination. The treatment is distinctively surgical. Rapid delivery with the aid of forceps, or by version, should be accomplished at the earliest moment. If the tear is in the lower segment of the uterus, immediate repair should be attempted. Should this fail, hysterectomy must be performed immediately by the abdominal route, as it offers the only possible recovery for the mother.

Hirst* reports that many a case of ruptured uterus may be saved by gauze packing of the pelvic and of the uterine cavity. He describes a case where, in performing a version and a slow careful extraction of the fetus for placenta previa, the lower uterine segment, ruptured cervix and vaginal vault, tearing like so much wet paper. There was an orifice into the peritoneal cavity, into which the outspread hand could be passed. The pelvis was packed with gauze and so was the uterus. The uterine packing was removed in twenty-four hours, but the pelvic packing was left undisturbed for four days, when it was removed and replaced by fresh gauze. The patient made an uncomplicated recovery. It is interesting in this connection to recall the series of ten cases thus treated, recently reported from Germany, without a death.

If, however, the rupture is anterior or lateral, where the placenta has escaped into the abdominal cavity, the control of hemorrhage and the evacuation of blood clots is the complication to

*Hirst: Surg., Gynec. and Obst., xx, 599.

be met, hence an abdominal section is then required, and most likely a hysterectomy.

PUERPERAL ECLAMPSIA

The toxemia of pregnancy may now be designated as a fatal blood metabolism arising from (1) hepatic insufficiency, hepatitis and necrosis, steatosis, or acute yellow atrophy; (2) acute fatty infiltration of the kidneys, or acute parenchymatous nephritis; or (3) splenic involvement with the same interstitial inflammation and pathologic changes.

Numerous factors help to shape the course of the toxemia. Nervous instability—reflex irritation—plays a prominent role; intraabdominal pressure or interference with the circulation and respiration, and compression of important organs, is a mechanical factor of great significance. Constipation may also increase the severity of the autotoxic state. Bacterial toxins must also be borne in mind, and lastly changes in the alkalescence of the blood. The presence of acetone and acetonuria may be, and often is, responsible for the toxic phenomena.

Diagnosis

Between the mild form and the more profound cases of puerperal eclampsia we find every degree of intensity. Moderately severe attacks often yield to timely treatment and many cases may be aborted if a proper realization of the approaching condition can be recognized. It is, therefore, highly important to examine the urine and measure the work of the kidneys. In those cases where the urine examination is negative, the diagnosis may be very difficult, but fortunately these cases are very rare, and when a pregnant woman is taken violently ill the possibility of the fulminating type of toxemia must not be overlooked, the cause carefully sought, and proper treatment given.

The clinical symptoms are of far more value to the general practitioner than a blood examination, nor is it always possible to determine the amount of amnionic acid, nitrogen, or fibrinogen outside of the laboratory. The mere occurrence of a convulsion in a pregnant woman is not always conclusive of eclampsia. It

may be epileptic, hysteric, or apoplectic. Epilepsy may be distinguished by the history of former attacks, and the patient falls suddenly with a cry, or usual aura, and lastly the urine is normal on examination. Hysteric patients are often conscious, the muscular contractions less pronounced, or opisthotonous in character, and have a history of laughing or crying preceding the attack. Edema of the limbs is absent, and the urine is usually clear and voided in large quantities. Apoplexy is very rare. It comes on suddenly after violent exertion, with prodromic symptoms. The coma is profound and convulsive movements are absent. Paralysis or hemiplegia supervenes early.

Symptoms

The nervous symptoms are usually characteristic of the intensity of the toxic state—restlessness, agitation, insomnia, vertigo, intense headache, prodromal symptoms of the gravest form of toxemia are nearly always associated with edema of the limbs, albuminuria, and other evidences of acute nephritis. If the edema is pronounced, it is indicative of an impending attack.

Stage of Invasion

The attack is sudden. The eyes have a peculiar stare, the lids twitch convulsively, the pupils contract to a pinpoint, then suddenly dilate widely. Some complain of intense pain as if struck on the head. Insensibility quickly supervenes, the neck is bent so the head burrows backward, the muscles of the mouth and alæ of the nose twitch or jerk convulsively. The mouth is drawn to one side, the head rotates, and eyeballs roll upward, the face and lips are cyanotic, the convulsive movements extend to the trunk and extremities, the tongue partially protruding from the mouth is often bitten, and the frothy saliva is tinged with red. Towards the close of the attack the patient may become violent, but usually the muscles relax and the breathing becomes labored and stertorous, and after a few moments the patient passes into a state of stupor or coma. This condition may last for from a few minutes to half an hour, when the patient, if recovery takes place, slowly returns to her senses. It is very exceptional for one

attack only to occur. The first is followed at irregular intervals by others more profound, and if uncontrolled, the coma becomes more pronounced until death occurs. In continued cases the temperature may run to 104° or 105°, and death is deferred from a few hours to several days.

Treatment

Should a convulsion occur in a pregnant woman prior to the eighth month, before the os is dilated or dilatable, or before nature has made any effort to expel the child, the author believes in conservative treatment, and from personal experience, feels he should insist that induced labor with forcible mechanical dilatation at this time is rarely justifiable, and should be reserved for exceptionally severe cases, where repeated convulsions have occurred and where medical treatment has entirely failed.

On the other hand, should the convulsion occur at any time after labor has commenced, the immediate emptying of the uterus is indicated and should be promptly performed. To wait under these circumstances usually means death of the child by asphyxia.

In the first stage of labor, when the os is not sufficiently dilated, bimanual dilatation properly performed, is safe and efficient, and the child may be delivered by version or with forceps. In these earlier cases should the eclampsia occur as the result of chronic nephritis, the Stroganoff's method of treatment, with morphine and chloral as hereinafter described, is considered now the most scientific method and most desirable. This treatment is followed by a diet of milk or buttermilk, with laxatives and diuretics as prophylactic measures.

Treatment of the Attack

The surgical treatment of eclampsia, rapid delivery by major surgical operation such as abdominal Cesarean section, hysterectomy, Sellheim's amputation of the breasts, decapsulation of the kidneys, or Zangemeister's trephining, are now considered as things of the past. The venesection of our forefathers is now universally conceded to be the best method of treatment during the attack, or seizure. This method of treatment, under the modern term of Zweifel's venesection, removed at least approximately

14 to 16 ounces of blood from a patient. It is resorted to in all eclamptic cases, even in those recently delivered, without waiting for the recurrence of further attacks.

This procedure is followed by Stroganoff's narcotic treatment. The technic is described as follows:*

"In moderately severe cases, first morphine, about 0.015 gram; in one hour, or sooner, 2 grams chloral; morphine again the third hour; chloral the seventh, and 1.5 grain chloral again the thirteenth and twenty-first hour. Delivery is hastened as necessary, and fluids are supplied by the rectum or mouth, from 150 to 250 c.c. four or five times a day. The aim is to prevent the convulsion, even if as much as 4 or 5 grams of chloral and 0.03 or .04 gram morphine plus chloroform occasionally are required in the course of five or six hours. If the convulsions keep up obstinately, delivery is hastened. Vaginal Cesarean section is indicated if necessary, but Stroganoff has never had occasion to resort to operative measures. He is convinced that the mortality of eclampsia can be reduced to one or two per cent, if this method is begun early and systematically carried through, in the absence of serious complications. It is applicable to eclampsia before, during, and after delivery, and experience has demonstrated that sedatives can be relied on as a mainstay in treatment."

PROLAPSE OR PRESENTATION OF THE UMBILICAL CORD

Some authors make a distinction between presentation and prolapse of the cord. The distinction is obviously useless so far as treatment is concerned, prolapse being merely a more advanced condition where a loop of the cord passes into the vagina or hangs from the vulva. This accident most frequently happens or appears after the escape of an unusual amount of liquor amnii, or in faulty presentations where engagement of the head of the child is delayed.

The position and degree of compression of the cord, governs the gravity of each case. All cases of funis presentation must be regarded as serious so far as the vitality of the child is concerned,

*Jour. Am. Med. Assn., Sept., 1912.

and upon the early detection and treatment of this accident depends the life of the child, in the majority of cases.

Treatment

In delayed cases where the prolapsed cord is flaccid and after continuous examination during the occurrence and remission of several pains, no pulsation of the cord can be felt, and especially when the fetal heart beat can not be detected and there is no longer fetal movements, hope of a living child should be abandoned and all efforts directed in the interests of the mother towards an early and safe delivery.

In cases where the complication is recognized early, the object in view is to devise means by which the funis may be pushed back or restored to the upper part of the uterus. There are several instruments that have been devised of flat steel or whalebone for this purpose, but in emergency cases the method of Michaelis has long been recognized as practical and can usually be carried out successfully. It consists in the employment of a large sized gum elastic or English male catheter, to the eye of which the prolapsed cord is loosely attached by a cord or narrow tape. The stilet is then introduced and the catheter carrying with it the cord, during the absence or lull of a pain, is steadily pushed up into the uterus in the direction of the fundus. The stilet is then withdrawn and the catheter allowed to remain until labor is completed. This method is simple and effective and far safer than the employment of complicated instruments devised for the purpose.

CHAPTER XI

POISON FROM DRUGS USED AS MEDICINES

POISONING FROM ACETANILIDE, ANTIFEBRIN, ANTI-PYRINE, OR PHENACETIN

Acetanilide is a derivative of aniline. It is the chief ingredient of many of the popular headache remedies. Its prolonged or continuous use may cause congestion of the liver, spleen, kidneys or heart, followed by fatty degeneration. Owing to impurities in the manufacture of the drug, or idiosyncrasy on the part of the patient, numerous cases of poisoning have resulted even from small doses, and several cases of fatal poisoning in infants and children have been reported following its use in the form of dusting powders, in the treatment of skin affections.

Symptoms

The most prominent symptoms of poisoning from acetanilide are cyanosis and collapse. The face, lips, and finger nails assume a peculiar blue color, respiration becomes more or less embarrassed, moistening of the skin, or profuse sweating is frequently observed, and subnormal temperature is the rule. The pulse is rapid, and in fatal cases pronounced physical exhaustion and tremors are followed by convulsions and coma, the heart being arrested in diastole. The drug is eliminated principally by the kidneys.

Treatment

The cardinal principles in the treatment of poisoning from acetanilide are, first, vigorous diffusible stimulants; second, external heat. When called early to the case, gastric lavage, or free vomiting with 20-grain doses of zinc sulphate, repeated every fifteen or twenty minutes until effective, or 1 to 3 drams of mustard in warm water, should be administered at once. Where absorption of the drug is manifest by cyanosis and threatened col-

lapse, efforts at gastric lavage are useless, and sometimes a dangerous waste of time. In these cases hot alcoholic drinks by the mouth, strychnine and caffeine, hypodermically administered to aid respiration, atropine, adrenaline, sulphuric ether or camphor hypodermically administered to maintain blood pressure are used. Artificial respiration, with inhalations of oxygen if cyanosis is marked, and enemas of hot normal salt solution, are the best known remedies. The patient should also be surrounded by hot packs until all evidence of the poisonous effects have disappeared.

POISONING FROM ACONITE—ACONITINE

All species of aconite (monkshood) are poisonous. *Aconitum napellus* is the only one officially used in medicine. It is a very attractive looking plant and hence popular in garden culture. The root of the plant has been eaten in mistake for parsnips and horse-radish, though distinctively darker in color, and when scraped has a disagreeable odor. Tincture of aconite or the active principle of the plant aconitina are the forms usually prescribed as a medicine.

Symptoms of Poisoning

The toxic effects of aconite are surprisingly rapid. Three drops of a strong tincture has been known to cause serious toxic symptoms, and according to some authorities, if given hypodermically, fatal results may follow in less than a minute. One of the earliest symptoms of poisoning from aconite is a peculiar burning, prickling or stinging sensation in the mouth, lips or throat, which rapidly extends over the whole body. The skin becomes cool and clammy; the heart action is rapid and very weak; muscular strength is early exhausted so that the slightest exertion may bring on fatal syncope. The temperature in poisonous doses is always subnormal and death results from paralysis of respiration. "After a fatal dose has been taken, the symptoms usually make their appearance very rapidly and death may result in half an hour. The average time required to produce death is rarely more than three hours, the longest case on record being five hours." (Shoemaker.)

Treatment

The cardinal features of the treatment of toxic doses of aconite are: first, gastric lavage, or emetics; second, recumbent position; third, cardiac and general stimulants; fourth, artificial respiration with oxygen. Digitalis is regarded as the physiologic antidote, but is usually slow in action, and should always be combined with atropine in full doses, with inhalation of amyl nitrate, the giving of hot stimulating enemas and placing the patient in a hot pack. Should the symptoms of poisoning abate, astringent infusions such as tannic acid, followed by alcohol or ammonia, may prove of great value. Prolonged artificial respiration with the administration of oxygen, with faradization over the heart and epigastrium are often essential in desperate cases.

ANILINE

Aniline is a derivative of bituminous coal tar, and is a powerful narcotic poison, and, combined with chlorine or chlorates, produces the various common dyes. Aniline is rarely employed in medicine, hence systemic poisoning is met with only in those engaged in its manufacture. Inhalation of the fumes or the ingestion of the drug itself produces alarming toxic symptoms, and frequently causes death. Muscular exhaustion, vertigo, headache, nausea and vomiting, impaired respiration and heart action are mentioned as the premonitory symptoms of absorption of the drug. The more pronounced symptoms being cyanosis, hematuria, abolishment of the reflexes, epileptiform convulsions usually preceding death by coma. Blood poisoning and various forms of cutaneous eruptions have been attributed to the wearing of clothing stained or colored with aniline dyes. Fuchsin, violet, malachite green and pyoktanin are the aniline preparations employed in the staining of tissues and bacteria, and while possessing antiseptic properties, are rarely employed in medicine, owing to their poisoning properties.

Treatment

The essential features are: first, stomach lavage or emetics; second, milk, whites of eggs, olive oil; third, purgation with castor oil; fourth, stimulants and cardiac tonics, hypodermically

and by rectum. The local manifestations of infection and poisoning from aniline dyes should be treated as other forms of dermatitis with local application of Tierce's solution, creolin, or ichthyol.

ALCOHOLIC POISONING

The modern "drunk" is a much more serious type of alcohol poisoning than the so-called "dead drunk" or hopelessly intoxicated patient of thirty-five or forty years ago. In the author's earlier hospital practice this class of patients was commonly brought to the hospital in a comatose condition, the face suffused or markedly congested, the surface of the body warm, and the pulse full and strong. The patient, oblivious to his surroundings, snored in apparent peace and comfort, seldom becoming obstreperous or combative unless aroused from his slumber.

The modern alcoholic presents a different type of symptoms. Local option, state-wide prohibition, and antisaloon crusades have limited the production and sale of the better grades of liquors, so the present worshiper of Bacchus is forced to content himself with the various alcoholic preparations in which the alcohol itself is of inferior quality and the adulterant more or less toxic. The so-called "jags" from bay rum, flavoring extracts, stomach bitters, and other proprietary medicines, are cases of alcoholic poisoning which render the patient restless, irritative and maniacal, difficult to control without incarceration or restraint.

Formerly it was considered the best treatment to put the alcoholic into a hot bath, after which he was rolled in a blanket to sleep off his debauch. If he was restless, morphine, bromides, or chloral was given in order to induce sleep and was followed later by an ounce of magnesium sulphate.

In the modern type of acute alcoholic poisoning, the toxic effects of the alcohol are increased by the addition of adulterants, which do not follow the imbibition of pure liquors distilled from grain. Of the adulterants, infusion of tobacco, sulphuric ether, cocaine, nux vomica, and wood alcohol are the most common, and hence it requires very careful observation to determine the toxic element responsible for the toxemia, and each case must be considered individually from the special train of symp-

toms present, before the proper treatment can be correctly determined.

Effects of Alcohol

The highest modern authorities (Hare, Thornton, etc.) agree that alcohol, when taken into the human body, does not act as a general or diffusible stimulant, as was formerly considered. It is true that it produces a temporary congestion of the capillaries and the surface of the body appears warmer, yet it deprives the internal organs of blood and thus acts as an equalizer of the circulation by forcing the blood to the surface, thus rendering the individual more susceptible to the effects of exposure to cold. The effect upon the nervous system is also marked. The increased activity and mental excitement is not the result of cerebral stimulation, but is due rather to the loss of control of the inhibitory centers, and with this there is release of energy, giving greater mental and physical activity causing the patient to lose control of his will power and judgment, in consequence of which he may commit acts or express himself in a manner that would never occur were the inhibitory centers not paralyzed by the poisonous effects of the alcohol.

Diagnosis

It is sometimes difficult, when, for example, an individual is found unconscious, to distinguish between acute alcoholic poisoning, an epileptic seizure, apoplexy, or a possible fracture of the base of the skull. The odor of the breath is not always positive evidence of intoxication. And, again, cerebral hemorrhage or fracture of the skull may be present as a complication. Therefore, in the absence of positive history, or where there is the possibility of a doubt, the patient should be kept under observation until his true condition can be determined.

Von Wedeking's test for drunken stupor is frequently successful; viz., "By pressing on the supraorbital nerve with a steadily increased force, one may with certainty of success bring an unconscious alcoholic to his senses and thus differentiate between alcoholic and other comas."

In acute alcoholism the brain and spinal cord are always the

seat of hyperemia, and in that class of cases where the first symptoms of pronounced poisoning is manifest by an epileptic form of convulsions, should the patient remain unconscious, with frequent recurrence of the seizures, in the absence of albuminuria, with later a gradual rise of temperature to 104° , 105° or 106° , it is conclusive evidence of pachymeningitis, or a secondary inflammatory involvement of the meninges of the cord and brain. On the other hand, should there be a convulsive seizure followed by coma, suppression of the urine, hyaline casts with albuminuria, and a high temperature, acute parenchymatous nephritis is evidently present and the convulsion may correctly be attributed to uremia.

Symptoms of Acute Poisoning From Alcohol

Acute poisoning from alcohol usually results where large quantities are taken at one time, as, for example, on a wager, in a spirit of braggadocio, or where a half pint or more of brandy or whisky is given for the supposed purpose of stimulating an individual following a prolonged exposure, or in an exhausted physical condition. The rapidity with which toxic symptoms appear depends upon the amount of alcohol taken. In many of these cases, symptoms of profound poisoning appear without the usual stage of excitement, the patient passing at once into a state of stupor, followed by profound exhaustion, epileptiform convulsions, and fatal coma. In the vast majority of cases, however, symptoms of poisoning are more slow in developing and usually follow a prolonged or long-continued debauch. These patients complain of nausea and vomiting, with headache, vertigo, a foul breath, coated tongue, and general condition of nervous exhaustion. The stomach refuses longer to retain the liquor. There is a gradual development of muscular tremors. The patient is usually now alarmed at his condition and the nervous symptoms increase until the condition is really pitiable. The face is suffused or bloated, and he soon passes into semidelirious condition, with hallucinations of sight and hearing, ending in acute coma. Death may result at any time from cardiac failure, uremia, or alcoholic pneumonia.

Treatment

In formulating a plan of treatment for acute alcoholic poisoning, the condition of the kidneys, heart, lungs, skin, and general

appearance and condition of the individual must always be carefully considered. The contents of the stomach should be immediately removed by the stomach tube, and repeatedly washed out with a strong solution of hot coffee before withdrawing the tube. The patient must be placed in bed, as rest in a recumbent position is the first requisite to recovery.

Where the patient is maniacal or uncontrollable and where because of the activity of the patient gastric lavage is difficult or impossible, the treatment *par excellence* is the administration of $\frac{1}{10}$ grain of apomorphine hypodermically.

This is known to the underworld as the "seven-minute shot" because of its effectiveness in removing all desire for further activity.

Emesis usually occurs within a few minutes and is followed by relaxation and sleep. The vomiting may be facilitated by inducing the patient, if possible, to drink a pint of warm water.

After the patient recovers from the effects of the apomorphine and profound sleep, active purgation should be instituted. This is best accomplished by the administration of three or four compound cathartic pills and one-half to one ounce of magnesium sulphate.

The use of opiates or sedative drugs is undesirable, but if delirium is active, paraldehyde in dram doses, bromides in 30- to 40-grain doses, or hyoscine, $\frac{1}{100}$ grain, subcutaneously, give the best results.

The second requisite is cardiac and diffusible stimulants followed by external heat. Of the cardiac stimulants, digitalis is considered the best, but, being slow in its action, should be combined with other drugs. Large doses of digitalis, 15 to 20 drops, with aromatic spirits ammonia one dram; carbonate of ammonia, 30 grains; or camphor, $\frac{1}{4}$ to $\frac{1}{2}$ grain may be given in solution; or digitalin, $\frac{1}{20}$ grain; strychnine, $\frac{1}{15}$ grain; caffeine, 1 grain; or spartein, $\frac{1}{2}$ to 1 grain, hypodermically every two hours may be preferable if stomach is very irritable. Later, carminatives, capicum, ginger, etc., may be of some service.

In addition to these, the patient should be placed in a hot bath, not only to assist the circulation, but with a view to aiding in the elimination of the poison through the skin and kidneys. It has

been a custom for years to continue to give alcohol in these cases, lest a total withdrawal would bring on fatal collapse. This is not true, and according to Strumpell, "is an out-worn superstition, for no treatment is more to be condemned than to treat a case of poisoning by giving more of the same poison."

In many cases hot broths, coffee, or other liquid food should be given at short intervals and commenced as early as possible, to be followed later by tonics and restoratives.

In pronounced cases of coma or continuous convulsions, especially when accompanied with venous stasis and cyanosis, venesection from six to eight ounces may prove of the greatest benefit, especially if followed by subcutaneous or intravenous saline solution. Chlorol hydrate, with large doses of ammonium, sodium or strontium bromide may also prove beneficial, but must be guarded in their use. Artificial respiration and inhalations of oxygen are likewise of advantage in many of the more pronounced cases.

Sequelæ

It has long been known that peculiar nervous affections often follow alcoholic poison. They were formerly attributed to disease of the spinal cord, and only of late have we obtained the knowledge that the greatest part of the cases of this kind are to be classed as acute alcoholic neuritis. The practical importance of this alcoholic neuritis is not slight: First, because it may be easily confused with other nervous diseases, especially with myelitis and tabes; and second, because its proper and timely diagnosis is of great significance in regard to treatment. The ataxia usually develops in the legs; more rarely in the arms. There may be slight disturbances of the sensibilities at the same time, but the patellar reflex is usually, but not always, absent. As a rule, with proper care and nursing, the patient recovers completely in a few weeks. The diagnosis of this primary acute ataxic form of polyneuritis is usually not difficult. The disturbance of the patient's gait may at first arouse the suspicion of tabes, but the history of alcoholism, the rapid onset of the symptoms, the perfectly normal pupillary reflexes and also normal micturition oppose it. We often find in some muscular regions a true paresis besides the ataxia which is not common in true tabes. In any doubtful case,

a favorable termination in recovery forms the final criterion in favor of alcoholic polyneuritis.

Alcoholic Gastritis

Loss of appetite, heavily coated tongue, foul breath, thirst, nausea and vomiting, vertigo, marked depression, and rapid pulse are the usual symptoms following an alcoholic debauch. There is also frequently pain in the epigastrium and abdomen, tenesmus with or without distention. Inability to retain food or liquids is often pronounced and constipation is also a very common complication.

TREATMENT

Lavage of the stomach followed by the instillation of 2 ounces of a saturated solution of magnesium sulphate and four compound cathartic pills, is usually sufficient to cause thorough evacuation of the intestinal canal and thus remove all toxic elements and hasten resolution. Should active purgation fail to restore the gastric tonicity and the nausea and vomiting continue, the administration of a capsule containing 3 grains each of cerium oxalate and veronal, or a powder composed of pepsin, bismuth and ginger every three hours will often bring good results.

The diet should be liquid until the stomach will tolerate the soft foods, and the patient must be kept at rest.

POISONING FROM BELLADONNA, OR ATROPINE, HYOSCYAMUS, HYOSCYAMINE, STRAMONIUM, DATURINE, DULCAMARA, SOLANINE, DUBOISIA, OR DUBOISINE

Atropine, the alkaloid, is the active principle of belladonna, or the deadly nightshade plant. It is a powerful poison, and symptoms of poisoning have been produced by the application of a very weak solution to the eyes. Many people are very susceptible to its effects, and when used as a mydriatic, the puncta of the eyelid should be kept closed with the tip of the finger for a few minutes to keep the solution from entering the duct and nasal cavity.

Symptoms

There is always a sense of heat and extreme dryness of the throat and fauces, with difficulty of swallowing, nausea and vomiting, dizziness, impaired vision, flushed face, and delirium of an excited, maniacal character, followed by convulsions, stupor, and coma. The pupils are extremely dilated, and insensible to light. Strangury, hematuria and suppression of the urine are not uncommon. A rash closely resembling scarlatina is frequently observed. Symptoms of poisoning are usually manifest within an hour or two after taking the poison. The fatal dose is placed at $\frac{1}{8}$ to $\frac{1}{2}$ grain. Poisoning by the passing of the solution of atropine from the eye into the nose and throat is usually transient in character. Dryness of the throat, slight fever and restlessness, dilated pupils, and possibly an erythematous eruption may result, but subsides with no alarming symptom in twenty-four to forty-eight hours.

Treatment of Poisoning from Atropine

Where the drug has been taken into the stomach, gastric lavage should be employed and the stomach washed out with warm water, after which a 20-grain solution of tannic acid in four to six ounces of water should be introduced and siphoned out of the stomach and be immediately followed by a strong infusion of tea or coffee. The physiologic antidotes that should be administered hypodermically are morphine $\frac{1}{4}$ to $\frac{1}{2}$ grain; physostigmine, or eserine, $\frac{1}{30}$ to $\frac{1}{60}$ grain; muscarine, $\frac{1}{10}$ to $\frac{1}{30}$ grain; and first jaborandi, or pilocarpine, $\frac{1}{2}$ grain; chloral hydrate and compound spirits of ether have also been employed as chemical antidotes; the remedies being repeated as indicated by the symptoms. Artificial respiration and strychnine in $\frac{1}{20}$ - to $\frac{1}{30}$ -grain doses may be found necessary in protracted cases, and external heat will be needed if collapse occurs.

POISONING FROM BISMUTH SUBNITRATE

Poisoning from the administration of bismuth subnitrate was formerly quite a common occurrence, owing to the fact that even the best preparations contain more or less arsenic. Of late years greater care has been observed in the manufacture of the drug,

hence poisoning from its employment in even large doses is not so often seen.

The free use of bismuth subnitrate as a dressing for open wounds or ulcerated surfaces, especially when introduced subcutaneously, as in the form of bismuth paste, may lead to absorption and poisoning. Acute gastroenteritis, nausea and vomiting, with a peculiar dark purple discoloration of the gums and entire mouth, followed by diarrhea and exhaustion, are the usual toxic symptoms, being very similar to those caused by lead, gold, or mercury. The discharges from the bowels are foul and black in color, and when the poison is eliminated, ulceration patches and sloughing may appear in the mouth or intestinal tract, with desquamative nephritis and albuminuria.

Bismuth subnitrate in the form of a paste 10 to 33 per cent, with vaseline, is now a popular remedy in the treatment of fistulous tracts, or for radiographic work, and for chronic suppurative diseases. Injections up to 100 grams of a 33 per cent paste is not considered toxic unless there is some idiosyncrasy on the part of the patient. But from larger doses, especially where the bismuth is retained for a long period in cavities and undergoes slow absorption, symptoms of intoxication, ulcerative stomatitis, dark purple gums, diarrhea, cyanosis with nephritis, and death may ensue.

"In the use of bismuth paste, there is danger of poisoning, and in sinuses of the brain, danger of compressing vital parts, if large quantities are used. A drop of paste injected into a vein may cause death almost instantly, and in acute conditions it may prove harmful, but the proportion of satisfactory results in these chronic cases is so vast that with proper precaution against toxic effects with the perfection of technic the method will find many advocates."*

Warfield recognizes three stages of bismuth poisoning: first, benign, when the violet black line only is present; second, moderating severely, with stomatitis, more or less acute, followed by a chronic condition, with discoloration of the gums, and tattooing of the buccal mucosa; third, a severe form characterized by more intense stomatitis, the gum margins ulcerated, secondary infections supervening, and general symptoms present. Characteristic

*Emil G. Beck: Surg., Gynec., and Obst.

of bismuth poisoning is the violet tinge to the line, and in the more severe forms the presence of a diphtheritic membrane. The plaques appear anywhere on the mucous membranes, preferably on the parts in contact with the teeth. A cessation of bismuth absorption brings about an immediate improvement. Albumin, casts, and bismuth may be found in the urine. The author concludes that the poisoning is due to the bismuth and not to the nitrates or other salts, such as lead or mercury.

Treatment

If the poisoning is the result of slow absorption of the bismuth which has been retained for a long time, the paste should be removed by the olive oil method. (Beck.) Warm olive oil, a pint or more, if possible, is injected through the sinus into the cavity, and retained for 24 hours, by which means the paste dissolves readily into a grayish liquid, which is removed by means of a small suction syringe, and if necessary, the injection of the oil is repeated. If poisonous symptoms appear after the ingestion of the bismuth, the alimentary tract should be cleared with a purgative of castor oil and all bismuth withdrawn.

In all cases of suspected poisoning from bismuth subnitrate, the urine should be tested for arsenic. This can readily be accomplished by the Reinsch's test. In an ordinary test tube the urine is boiled with about one-eighth of its bulk of pure hydrochloric acid. Into this is placed a small strip of bright polished copper, and if arsenic is present the copper will become immediately tarnished; in which case dialyzed iron in 30-drop doses, or the hydrated sesquioxide of iron in the moist state should be freely given. Olive oil, gruel starch, linseed tea, or elm bark mucilage, may be given to allay stomach or intestinal irritation. Opiates will be needed to control the pain. The patient should be kept warm and brandy or whisky given to prevent collapse.

The following prescription is of value in stomatitis:

R	Potassii chlor.	gr. xl
	Tinct. ferri chlor.	℥i
	Syrup	℥i
	Aqua menth. Pip. q. s. ad.	℥iv
	M.	

Sig.: 1 teaspoonful every 3 hours.

POISONING FROM CHLORAL HYDRATE

Chloral is a popular hypnotic, and is used indiscriminately by the laity. It causes sleep by producing anemia of the brain. It affects principally the motor nerves, muscular weakness and exhaustion being among the more prominent symptoms in chronic chloral poisoning.

Chloral is a powerful heart depressant, hence should not be employed in alcoholics or those afflicted with fatty degeneration of the heart. The lethal dose is somewhat remarkable, owing to the variation in the quantities capable of causing death. Several instances are recorded where fatal results followed a single dose of ten grains, whereas, other cases have recovered after taking as much as one-half to an ounce. Chloral is eliminated principally through the kidneys and breath, to which it imparts a peculiar odor. Children seem to bear large doses, and animals poisoned with chloral usually recover if kept warm. "Knock out" drops sometimes used by crooks to render their victims unconscious are composed of chloral hydrate and are given in beer or port wine.

Symptoms

In toxic doses there is always lowering of blood pressure and temperature, dysphonia due to weakened heart action is always present, and death may occur very suddenly without warning, even to the patient, possibly the result of cardiac syncope. The pupils are usually contracted, with some congestion of the conjunctiva and swelling of the eyelids. The patient if seen at this time is drowsy and incoherent in his talk.

Treatment

Unfortunately, death often takes place before the arrival of the physician. If, however, there is evidence of life, the patient should be immediately surrounded with hot water bottles and warm blankets. A hypodermic injection of ether, atropine $\frac{1}{50}$ grain, or strychnine $\frac{1}{20}$ grain, with inhalations of amyl nitrate ammonia should be administered, and should the patient rally sufficiently, the stomach should be promptly evacuated with the tube, and hot coffee, hot brandy or whisky given before the tube

is withdrawn. Efforts to overcome the stupor should be made by shaking, slapping or loud shouting, and artificial respiration is often essential and should be continued until the heart action is much improved. Purpura hemorrhagica, vesicles, wheals, or ulcerations are cutaneous manifestations which frequently follow toxic doses of chloral.

POISONING FROM CALABAR BEAN, PHYSOSTIGMA, PHYSOSTIGMIN SULPHATE, ESERINE

The physiologic action of physostigma and its salt is precisely the reverse of nux vomica and strychnine. It appears to be a direct spinal depressant, and is employed in the treatment of tetanus, myelitis and various nervous diseases. It is also employed to increase peristalsis and the salt of physostigma, eserine, is used by oculists in the treatment of glaucoma and other eye diseases. It is a powerful poison and in toxic doses produces extreme muscular weakness, vomiting and purging, and death is caused by cardiac syncope, or paralysis of the respiratory center. One of the characteristic physiologic effects of physostigma is the power to contract the pupils, which distinguishes it from atropine, or belladonna. The employment of eserine instilled into the eyes in some patients, causes vertigo and vomiting, with intermittent heart action. Others become drowsy and pass into a mild form of stupor, with delusions, but severe or fatal cases of poisoning therefrom are seldom reported.

Treatment

The physiologic antidotes are atropine and strychnine, which should be hypodermically administered. Atropine should be given cautiously, commencing with $\frac{1}{60}$ grain and gradually increased every three or four hours until dilatation of the pupils is manifest. Brandy or aromatic spirits of ammonia may also be given as deemed necessary.

POISONING FROM COCAINE

Cocaine is an alkaloid obtained from the leaves of *Erythroxylon coca*. Taken in modern amounts, cocaine stimulates the central nervous system, producing an exhilarating effect, and for

this reason has become a habit-forming drug, producing in the confirmed habitué utter mental and physical degradation. Very often it is combined with morphine and is taken both hypodermically and by the mouth. It is also taken with whisky or brandy and appears to increase the intoxicating effect.

In overdoses, cocaine acts as a depressant, lowers the blood pressure, causing headache, with loss of sight and powers of locomotion. At the same time there is incoherence of speech and confusion of ideas. Again, the symptoms of poisoning may be manifested by severe vomiting, with cramps in the stomach and limbs, rapid and full heart action, cyanosis, and a feeling of constriction of the chest or suffocation. There is usually a low muttering delirium and clonic convulsions. Death results from paralysis of the heart or nerve centers.

It occasionally happens that the application of cocaine in solution employed as a mydriatic, or applied to the throat, nose or urethra, has been followed by great muscular exhaustion, dysphasia, pharyngeal paralysis, loss of consciousness, and even death. The amount of the drug absorbed in these cases being evidently so small, the effects can only be explained through idiosyncrasy. The parts most susceptible to the action of cocaine appear to be the upper fossa of the nose, middle turbinate bone, and the male urethra.

Treatment

Emesis with mustard and hot water, apomorphine, or gastric lavage as early as possible is very desirable. If the tube is used, the stomach should be washed out and this procedure followed with a solution of tannin, 20 grains to four ounces of water, after which a strong infusion of hot coffee should be given at short intervals. Inhalations of ammonia or amyl nitrate to control the heart depression, hypodermics of morphine, $\frac{1}{8}$ grain with nitroglycerin $\frac{1}{100}$ grain, and brandy or whisky as stimulants are often indicated.

In pronounced cases, to overcome the asphyxia, the lungmotor, with oxygen, should be employed. The after-effects, which may last for weeks, consisting of persistent headache, insomnia, and nervous exhaustion are best overcome with strontium bromide, ten grains to the dram, with rest and tonics as restoratives.

POISONING FROM CROTON OIL

Croton oil belongs to that class of vegetable or plant poisons known as drastic intestinal irritants, or cathartics. The most powerful of the drastic poisons are croton oil, elaterinum, scammony, colchicum, jalap, gamboge, aloin, and podophyllin, and are distinguished for their irritant impression on the mucous membrane of the alimentary canal. The symptoms produced by this class of poisons are practically the same—vomiting, purging, pain in the abdomen, cramps, tenesmus, strangury, and collapse.

Croton oil is extracted from seed of the croton tiglium, and its poisonous properties are due to a peculiar fatty acid, crotonic acid, which it contains in variable quantities. When deprived of this acid the oil is harmless. The minimum fatal dose is said to have been one drop given in divided doses to an infant. A number of cases are reported where from three to eight drops in divided doses have produced death, although there are a number of cases in which recovery follows after as much as one dram of the oil has been taken.

Treatment

Gastric lavage should be used in plenty of water to wash out the stomach, followed by olive oil, whites of eggs, milk, mucilage or gelatin in solution, morphine hypodermically, or tincture opium by mouth to control the pain and tenesmus, repeated as indicated, and large doses of bismuth subnitrate to allay the irritation of the alimentary tract. Should collapse supervene, external warmth is necessary, with alcohol and strychnine administered as stimulants.

POISONING FROM CHLOROFORM AND SULPHURIC ETHER

Chloroform, when taken internally in toxic doses, is a powerful depressant upon the vasomotor system, and capable of producing death in the same manner as when taken by inhalation. Some authors claim that when taken internally in lethal doses, chloroform may cause sudden death by coming in direct contact with the heart muscles by its power of penetration chloroform being poison-

ous to all living protoplasm with which it comes in contact in concentrated form. Taken in toxic doses it also causes violent gastroenteritis, with cyanosis, weak, irregular pulse, and reduction of blood pressure. The temperature also falls below the normal, the pupils dilate, and the patient rapidly passes into a state of coma. The breathing becomes stertorous, the pulse imperceptible, and general convulsions are common. Death may also occur calmly and without a struggle. The lethal dose is regarded as from one-half to four ounces.

Treatment

When taken into the stomach in a lethal dose, the stomach should be immediately evacuated with a stomach tube and washed out with a solution of sodium bicarbonate, one ounce to the pint of hot water. This should be followed by a solution of hot coffee or brandy, which is allowed to remain in the stomach. Hypodermics of strychnine, adrenaline or aqua camphor should also be given, and, if indicated, inhalations of amyl nitrate or ammonia. Hot normal salt solutions by rectal enemas with the external application of heat and artificial respiration, if indicated, should be employed as early as possible, and the patient, though apparently improving, should be carefully watched for several hours.

Sulphuric ether when taken internally is more of a diffusible stimulant and its effect more transitory than chloroform. Its employment as a beverage or stimulant in place of alcohol is not uncommon, and if long continued tends to cause an aggravated form of nephritis. When taken into the stomach in moderate amounts, it increases blood pressure and acts as a cardiac stimulant—in this respect almost the reverse of chloroform. Narcosis has often followed the personal inhibition of the drug, and it is not uncommon to find the habitue unconscious from the effects of the drug. The face is flushed and covered with perspiration; the breathing is noisy, and the general appearance of the patient, with the strong odor of ether in the breath, is usually sufficient to make the diagnosis plain. In overdoses ether depresses the heart and paralyzes the respiratory center. The treatment is practically the same as that for chloroform.

POISONING FROM DIGITALIS—DIGITALIN (FOXGLOVE)

Cases of poisoning from digitalis, while not uncommon, are rarely reported or unrecognized. Its indiscriminate employment in infectious diseases, such as pneumonia, has been responsible for many deaths; and, yet, properly administered in selected cases, it is one of the most valuable drugs in the pharmacopeia. One of the characteristics of digitalis is its cumulative powers—its tendency to develop its full and toxic effects after its continued apparent inertia. Digitalis is composed of a number of active ingredients. Digitoxin is now known as the chief heart stimulant, although the digitalin of Schmiedeberg also has a stimulating effect. Digitonin, another active ingredient, is not only a heart depressant, but produces the same effect on the pneumogastric nerves; hence, should the physician desire to obtain the full effects of digitalis the whole drug must be given, rather than any of its active principles.

Digitalis is contraindicated in aortic regurgitation, or where the heart is feeble from infectious diseases, as it causes over stimulation and degeneration of the heart muscle. It is not possible in this class of cases to produce any good results by its administration. It is likewise contraindicated in atheroma or where degenerate changes in the arteries occur, and where there is high arterial pressure, as in aneurysm.

In toxic doses, digitalis causes vomiting and purging, with severe abdominal pain, sense of heat in the head, vertigo, and distorted vision. The pupils are dilated, and the effect upon the circulation is markedly characteristic; viz., the pulse may be full and slow in the horizontal position, and although the heart beat may be strong, yet on the patient sitting up, the pulse becomes feeble, small, rapid and irregular, with prostration and a tendency to syncope. Again, in over doses of digitalis, the eyes appear prominent, the sclera of the eyes acquire a peculiar bluish color (Tardieu); sometimes there is abundant salivation and suppression of urine, which is soon followed by delirium and stupor. Convulsions are apt to occur and usually precede death. The remarkable variation of the pulse between the supine and erect posture,

combined with the dilated pupils and profound debility, are characteristic of the poisoning from digitalis.

All the derivatives of digitalis are more toxic when given hypodermically.

Treatment

Recovery from poisoning by digitalis is usually very slow, sometimes delayed for weeks. Aconitine and saponin are supposedly the physiologic antidotes. The aconitine administered hypodermically in $\frac{1}{250}$ to $\frac{1}{100}$ grain may be given every four to six hours. Gastric lavage followed by a solution of tannin, siphoned out of the stomach and replaced by strong coffee or alcoholic stimulants, and patient being kept in a recumbent position and surrounded by artificial heat, are the usual requirements in the treatment of these cases. Hot demulcent drinks, and saline enemas are beneficial. The compound tincture of cinchona or tincture ferric chloride are useful as tonics and restoratives. So long as the function of the kidneys remains intact, recovery may be expected.

POISONING FROM OIL OF TANSY, OIL OF SAVIN, OIL OF PENNYROYAL, OIL OF DOG FENNEL, ETC.

These oils are seldom used in medicine except in combination with other drugs. Many deaths are reported from their employment by the laity owing to the popular idea that they produce abortion. In the majority of instances death has resulted from the violence of inflammation in consequence of their reckless use, without causing the expulsion of the fetus. All these oils possess powerful irritating properties in overdoses, and do not possess any specific abortive powers.

Symptoms

The symptoms of poisoning are similar to those of other vegetable irritants; nausea and vomiting, violent purging, severe abdominal pain, rapid, feeble pulse, dilated pupils, convulsions, coma, and asphyxia. Very grave symptoms have followed the ingestion of five to ten drops.

Treatment

Empty the stomach by emetics of mustard and hot water, or by means of a gastric tube. If the latter is used, wash out the stomach and introduce olive oil, whites of eggs, or gelatin in solution. Later, demulcent drinks of flaxseed tea, elm bark or arrow root should be allowed freely. The body should be kept warm with artificial heat, morphine administered hypodermically to control the pain, and alcohol and strychnine as general stimulants.

POISONING FROM OPIUM, LAUDANUM, OR TINCTURE OPIUM, PAREGORIC, MORPHINE SULPHATE, MOR- PHINE ACETATE, CODEINE, DIONIN, HEROINE, CANNABIS INDICA, ETC.

The toxic effect of opium and many of its salts or derivatives is not due to the drug itself, but by the formation of oxymorphone, which is produced in the system in the process of oxidizing the drug, and also to narcotin, one of the alkaloids. In some instances with certain individuals this secondary effect of opium is so severe as to prohibit the employment of the drug. After taking the lethal dose of opium, there is usually a period of general excitement, exhilaration of the pulse, warm skin, flushed face, with an increased activity of the brain. This soon gives way to a period of repose, to be succeeded by a soporific stage. When under the full influence of the drug, the patient lies in a deep stupor, the eyes closed, pupils contracted and insensible to the light, respiration slow and stertorous, and as the case advances, the countenance becomes pale and ghastly, lips livid, the skin cold and clammy, respiration very slow, ten to twelve to the minute, the muscles of the body relaxed, and the lower jaw drops. The pulse is very feeble, or scarcely perceptible, and may become very rapid. Cyanosis or venous congestion is marked, but may disappear temporarily where the patient is partially aroused, but as he sinks back into unconsciousness the blueness returns.

Fatal Period

According to many authorities, death ordinarily occurs in fatal poisoning by opium in from seven to twelve hours. In a number

of instances death, preceded by violent symptoms, resulted in thirty to forty minutes; and, on the other hand, death may be delayed beyond the normal period as late as twenty-four or forty-eight hours. As a rule, however, when a patient survives twelve hours, there is usually good hope for recovery.

Fatal Dose

One ounce of laudanum, equivalent to about 40 grains of opium, is considered a fatal dose, although recoveries have been reported where 3 or 4 ounces have been taken with suicidal intent. Four or 5 grains of powdered opium may be regarded as the minimum fatal dose for an adult. The lethal dose of morphine administered by the mouth is considered to be one to one and a half grains. Taylor mentions four recorded cases in which one grain of the muriate of morphine proved fatal to an adult; in one, in solution; in the second, in pill form; in the third, in powder; in the fourth, by hypodermic injection. In the first of these cases the morphine was taken in divided doses in six hours. The patient died in about seven hours. The second case died in thirteen hours, the symptoms coming on in three hours. No morphine was discovered in the stomach after death. In the third case death ensued in ten hours. The symptoms did not appear for about three hours. In the fourth instance one grain of morphine was administered hypodermically in three divided doses, all within ten hours. The man slept quietly for two hours. He then took dinner and engaged in conversation, but in another hour he suddenly became insensible and died two hours after in profound narcotism. We have known the case of a gentleman in whom three-fourths of a grain given hypodermically proved fatal within twenty-four hours. (Taylor, "Medical Jurisprudence.")

External applications of morphine, or used in the form of an enema, are sometimes attended by fatal results. Reece mentions a case in which one grain sprinkled over a blistered surface produced alarming symptoms within two hours from which the patient, an aged lady, barely recovered.

Anstie reported a case in which an enema of three grains of morphine caused death in sixteen hours.

Susceptibility of Children and Elderly People to the Effects of Opium

Children and elderly people are extremely susceptible to the narcotic effect of opium. Many instances can be cited where death has ensued in infants from one- or two-drop doses of tincture of opium, or five to ten drops of paregoric. Reese calls attention to the fact that old samples of laudanum or paregoric kept in bottles which are frequently opened are prone to be considerably stronger than freshly prepared solutions in consequence of the evaporation of the spirits, hence it is quite possible that a single drop of laudanum taken from the residue of a bottle might possess the strength of two or three drops of an ordinary preparation. In young children death has followed the taking of a grain of Dover's powder, and one dram of "Winslow's Soothing Syrup" has proved fatal to an infant. It is also well known that opium applied to the skin, used as a rectal injection or introduced into the ears of an infant may produce dangerous or fatal results.

The influence of idiosyncrasy and habit is described by Reese as follows: "This is particularly observable in the case of opium, and is of sufficient medico-legal importance to admit of brief notice here. Christinsson mentions an instance of a gentleman who was always narcotized by only seven drops of laudanum, and Taylor observes alarming symptoms from the injection of one grain of opium. Grisolle states that he saw narcotism induced in a lady by half a grain. Every physician can recall cases where persons have been unable to take even the smallest quantity of this drug, owing to some peculiarity of constitution. Sometimes, though more rarely, there is a remarkable natural tolerance of opium which can not be ascribed to habits. In aged persons an ordinary dose of opium may occasion alarming and even fatal consequences. Several instances of this character are given by Christinsson, and they should be remembered by the legal physicians, since similar ones might be brought forward as instances of intentional poisoning. Every person is aware of the effects of habits in modifying the tolerance of opium, 30, 50, and even 100 grains a day being sometimes taken without harm by some opium eaters.

Treatment

Every effort must be made to remove the poison from the stomach and intestinal tract. Emetics do not, as a rule, act well, owing to the torpid and relaxed condition of the stomach. If emetics are given, the dose should be at least double the ordinary quantity. The stomach tube is more reliable, and therefore preferable. After emptying the stomach, it should be thoroughly washed out with the chemical antidotes, potassium permanganate, 2 grains to the pint of warm water. After siphoning out the permanganate solution, a strong solution of coffee should be given. After flushing of the lower bowel, the colon tube should be introduced as high as possible, and a strong solution of coffee introduced, and if necessary retained by the aid of an assistant holding or pressing a folded cloth over the anus.

Atropine two to five minims of a one per cent solution with camphor water and strychnine $\frac{1}{30}$ grain should be given hypodermically every 10 or 20 minutes for three or four doses. The next point is to overcome the stupor or constantly increasing lethargy. For this purpose cold water may be dashed upon the face and chest, the patient should be kept walking between two attendants, and shouting, shaking, or slapping with wet towels may counteract the tendency to stupor. Should these means fail, the electric wire brush with a fairly strong current should be applied rhythmically to the muscles of the chest and spine, so the patient will be forced to breathe voluntarily. This means is often effective. The use of the lungmotor with the introduction of oxygen is also of great value. Treatment must be continued until the patient is fully conscious, can be easily kept aroused, and until the pupils dilate, and breathing becomes natural. It is equally important not to overdo the matter of walking the patient or pounding him in order to keep him awake, for he is easily exhausted and too constant walking may do considerable harm.

POISONING FROM ASPIDIUM, OR MALE FERN

The oleoresin or ethereal extract of aspidium, or male fern, employed chiefly as a remedy for tapeworm, has proved highly toxic in a number of cases. Large doses have been followed by

nausea and vomiting, with severe symptoms of gastrointestinal irritation, and not infrequently followed by tetanic convulsions and death. The autopsy in a number of instances of fatal poisoning revealed marked congestion, with hemorrhagic areas of the stomach and small intestines, accompanied by edema of the lungs and congestion of the kidneys, death being attributed by Prevost to paralysis of the heart. Castor oil is said to increase the toxic effects of oleoresin. Owing to the uncertain or indefinite strengths of the extract, the dose should not exceed one or two drams to an adult, and is much safer when combined with other tenniacides, such as peponis and terebinthinæ.

Treatment

Thorough elimination by means of gastric lavage and the administration of magnesium sulphate, and the hypodermic injection of aqua ammonia or camphorated oil, with enemas of normal salt solution, is usually effective if administered early.

POISONING FROM PHENOL, OR CARBOLIC ACID

Poisoning from carbolic acid is very common, owing in part to its popularity and general use as a household antiseptic, and the red or pinkish colored oily looking fluid in its stronger solutions is not infrequently taken in mistake for cough syrup, castor oil and other medicine. Carbolic acid is a derivative of coal tar, or may be distilled from resins, bones, wood, etc., and although called an acid, is neutral to the test of litmus, and has more affinity with alcohol than with acid. The commercial acid has a peculiar pungent odor and slightly sweetish taste. In its concentrated form it is a powerful irritant, both externally and internally. It whitens and hardens, as well as anesthetizes the skin and mucous membrane. In its chemically pure form, carbolic acid has but a faint aromatic odor, is colorless, and forms a solid mass of needle-like crystals, becoming deliquescent on the application of heat, or the addition of water, glycerin, or alcohol. It is not classed as a corrosive poison, as it possesses a distinctive narcotic power or action on the brain, common to other alcohols, ether, chloroform, etc., which quickly renders the patient unconscious. It is equally destruc-

tive to life if applied externally over any considerable surface of the skin in its concentrated form. Medical literature for a time was replete with numerous cases of gangrenous wounds from the application of strong solutions in the antiseptic treatment or dressings. The continuous application of a 5 per cent solution as a dressing to open wounds has been known to produce fatal results, and weak subjects, women and children, alcoholic or diabetic patients, are especially susceptible to its absorption. These disastrous results of its use have led to the abandonment of the remedy, or its employment in much milder strength. The fatal dose varies within wide limits. One dram of the pure acid has been followed by fatal consequences in an adult and individuals have recovered where one ounce or more has been taken.

Symptoms

After swallowing a lethal dose of carbolic acid, death may occur suddenly from shock or the result of respiratory paralysis, or the toxic effect of the drug on the brain and cord. Reviving from the first effect, there is usually an intense burning in the fauces, throat and stomach, with nausea and vomiting of a frothy mucous. Pallor is marked, the skin cold and clammy, the heart depressed, and respiration difficult. The pupils are contracted and general insensibility supervenes, which soon passes into coma, with stertorous breathing. Abdominal pain of a severe type is common, but not always present, and if the patient is conscious when first seen by the physician, he expresses great fear, and nervous symptoms are pronounced. Absorption by the skin of the strong acid, should it cover a large surface, is rapid and leads to equally fatal results with all the concurrent symptoms of the internal administration of the drug.

The author recalls a case where a little girl three years of age in reaching up, accidentally pulled from a shelf a four-ounce bottle of carbolic acid, pouring the contents over a portion of the abdomen and the upper and inner surfaces of the thighs. She was thinly clad, and the clothing held the acid in contact with the skin. I arrived within 15 or 20 minutes following the accident. The child was then unconscious, pupils contracted, face deathly pale and breathing embarrassed. The pulse was 140 and very

weak. The clothing had been removed and revealed the well-defined burned area of the skin. Alcohol was immediately applied followed by gauze dressings saturated with glycerin. Reaction was slow. A laxative dose of sodium sulphate was given and stimulants of whisky and aromatic spirits of ammonia freely administered. Within eight hours the urine was noticeably of an olive green color and small doses of sodium sulphate were repeated at regular intervals. After three or four hours, carron oil was substituted for the glycerin which proved very soothing and the child ultimately made a good recovery without any noticeable scarring.

Treatment

Prompt action is very essential in the treatment of carbolic acid poisoning. While alcohol is the most efficient antidote for carbolic acid burns of the skin, several prominent toxicologists now claim it is of very little value, and perhaps harmful when given internally as an antidote for this form of poisoning, since it forms a solution which aids in the rapid absorption of the acid. It has been clearly demonstrated* that the most efficient internal antidote is sodium sulphate administered in large quantities as a gastric lavage. This not only prevents the absorption of the poison, but also acts as a purge which sweeps the stomach and bowels free from the poison, the mucous debris, and effete material. However, the sodium sulphate is not always at hand, but it has been shown that the magnesium sulphate (Epsom salts) is equally efficacious and is always obtainable and convenient. Following the thorough gastric lavage with the Glauber or Epsom salts a few ounces should be left in the stomach to act as a purge. Put the patient to bed, surround with hot water bottles and give hypodermic injections of camphorated oil 20 minims, or of atropine sulphate, $\frac{1}{150}$ grain, or of adrenalin 1:1000 solution 20 minims, to stimulate the heart and the vasomotor system and to bring about reaction from shock.

For the pain give morphine sulphate, $\frac{1}{4}$ grain. Cider vinegar, freely given, or a strong solution of soap suds is antidotal, and, therefore, both are household emergency remedies of actual value.

If the mouth and esophagus have not been too severely burned,

*Macht: Bull. Johns Hopkins Hosp., April, 1915.

so as to prevent swallowing, a few ounces of cold milk should be given when the patient regains consciousness. If the patient can not swallow because of severe burns of the mouth and esophagus, give a nutrient enema of milk, eggs, and whisky. Support the circulation and give sufficient salines to keep the bowel clean of sloughing mucous membrane.

LYSOL POISONING

Lysol, a clear, brown, oily liquid, a synthetic compound of phenol or cresol is being used very extensively now in the household as an antiseptic for vaginal douche, or where a local antiseptic is desired.

It is often taken in concentrated form by mistake or for suicidal purposes, and a brief discussion of this form of poisoning is essential.

Symptoms and Treatment

Being a coal tar derivative, the symptoms are nearly those given under the head of Phenol Poisoning.

The local antidote is alcohol, while the internal treatment calls for the gastric lavage with solutions of magnesium sulphate or sodium sulphate with stimulants necessary to support the heart and cause reaction from shock.

POISONING FROM QUININE

Quinine in those susceptible to its toxic effects, even in small doses, causes more or less nausea and vomiting, tinnitus aurium, vertigo, and insomnia. The pulse rate is increased, and congestion of the genitourinary tract may result. In many patients a scarlatina form of eruption or violent urticaria frequently follows, the rash being attended by severe burning and itching. Several deaths have been reported from the ingestion of excessive doses of quinine, due possibly to tissue changes in the body.

Treatment

When the symptoms are annoying, the alimentary tract should be cleared by calalactose or a mild purgative of magnesium sul-

phate, and if prostration is marked, brandy or hot coffee may be given at stated intervals. Amyl nitrate by inhalation, to dilate the arterioles, and nitroglycerin to sustain the effects, are highly extolled by Sajous. Where there is much irritation, soothing lotions of borie acid and camphor water, or sodium bicarbonate in mild solutions may be applied. Quinine is slowly eliminated by the kidneys, and the eruption may not subside for several days. Cinchonism may often be prevented by the administration with the quinine of dil. hydrobromic acid in half-dram doses. Quinine should not be administered to a patient afflicted with cystitis.

SANTONIN POISONING

A number of cases of poisoning have been reported as occurring in children from two to twelve years of age where the remedy has been prescribed as an anthelmintic. One grain of santonin proved fatal to a boy of five and a half years, and a girl of ten died as a consequence of having eaten so-called worm candy or lozenges estimated to have contained about two grains.

Symptoms

An overdose of santonin disturbs the nutrition of the nerve centers, producing a peculiar condition called "yellow sight" or vision (chromatopsia), which may be followed by a loss of vision for a few days. Intestinal disturbances, vomiting, and sometimes diarrhea, with muscular exhaustion, tremors, and even tetanic convulsions, are common. The pupils are dilated, the skin cool and clammy, and breathing becomes stertorous, and death results from respiratory failure, or asphyxia.

Treatment

Santonin is eliminated through the kidneys and always causes an increased flow of urine. A brisk laxative to clear the intestinal canals, followed by aromatic spirits of ammonia in 5- to 10-drop doses, repeated frequently, with caffeine, carbonate ammonia, and other diffusible stimulants may be given as indicated. Atropine and strychnine by hypodermic, with hot packs and artificial respiration in pronounced cases, usually suffice to overcome the poison.

Santonin is best administered to children in half-grain doses combined with calomel, one-half to one grain, which not only acts as a laxative, but increases the anthelmintic action.

POISONING FROM STRYCHNINE AND NUX VOMICA

Owing to the legal restrictions upon the sale of strychnine, poisoning therefrom is now quite rare.

Symptoms

After taking the lethal dose of strychnine the individual soon complains of a feeling of fatigue and restlessness, with difficulty of breathing, or sensation of suffocation. Very soon there is twitching of the muscles of the face and limbs, followed in a short time by violent convulsions. The symptoms closely resemble those of tetanus. Opisthotonos is very common; and one of the peculiar characteristic symptoms of poisoning by strychnine is the fact that during the convulsions, the patient is conscious of his condition and surroundings. The face is usually livid, or cyanotic, eyes staring, and pupils dilated. The suffering may become intense, and, gasping for breath, the sufferer pleads for relief. Thirst is also a prominent symptom, but attempts to swallow often bring on a convulsion. Death results from exhaustion or asphyxia owing to the tetanic fixation of the muscles of the throat and chest. Death ordinarily occurs in from one to two hours.

Fatal Dose

The susceptibility to the action of strychnine varies greatly in different individuals. The maximum medical dose is $\frac{1}{15}$ of a grain. The ordinary fatal dose of strychnine for an adult is stated to be one-half to one grain.

Treatment

Prompt gastric lavage or thorough emesis by means of warm water and mustard is very often essential to recovery. If the convulsions or rigidity of the jaws prohibit swallowing, chloroform should be administered, the stomach tube introduced, and

after washing out the stomach, a solution of potassium bromide, 60 to 80 grains, with chloral hydrate, 40 grains, should be given before the withdrawal of the tube, and repeated in one-half hour if necessary. Apomorphine, $\frac{1}{6}$ grain, hypodermically, is recommended to relax the arteries, and at the same time inhalation of amyl nitrate should be administered to sustain heart action. Chloroform in one- to two-dram doses given by the stomach is said to relieve the pain far better than morphine. Hot saline solution intravenously or by hypodermoclysis, and rectal enemas are stimulating and helpful in arresting the action of the poison on the nerve centers.

**POISONING FROM SALICYLIC ACID, SODIUM SALICYLATE,
ASPIRIN, AMMONIUM SALICYLATE, STRONTIUM
SALICYLATE, SALOL, ETC.**

The salicylate exists naturally in various plants, but for pharmacy uses it is prepared synthetically from carbolic acid or oil of gaultheria. Salicylic acid is usually absorbed rapidly, but eliminated very slowly. Its toxic effects are particularly apt to occur in drunkards, or in those of uric acid diathesis. It is a very popular remedy for rheumatism and la grippe, and much used by the laity.

Symptoms

The symptoms of poisoning from the many and various preparations of the salicylates differ widely in character. In some the ill-effect may justly be attributed to idiosyncrasy. Salicylic acid is, however, an irritant to mucous surfaces, and should not be administered except in solution. The author had recently a case of poisoning from five grains of aspirin in a lady who had been accustomed to taking the drug occasionally for headache of rheumatic origin. About an hour after taking the drug, a 5-grain tablet, she became suddenly quite dizzy and complained of a peculiar suffocating sensation and feeling of exhaustion, with partial blindness, ringing in the ears, which was soon followed by a violent urticaria, with rapid swelling of the face, eyelids and lips, to such a degree as to render her features unrecognizable.

The temperature and pulse were normal, there was no embarrassment of respiration except from nervousness, nor was there any nausea or vomiting. The treatment consisted of a purgative dose of magnesium sulphate and local applications of a five per cent aqueous solution of ammonium chloride with aromatic spirits of ammonia in 20-drop doses as a diffusible stimulant. Elimination was very slow. The swelling of the face gradually disappeared in six or eight days.

The usual symptoms of poisoning from the salicylate are those common to all irritants: nausea and vomiting, headache, with tinnitus aurium, profuse sweating, partial or complete blindness, ptosis and impairment of hearing. The urine becomes olive green after large doses are taken, and a number of instances are reported where suppression of the urine and convulsions, followed by death from paralysis of respiration, have occurred. Toxic doses have also been known to produce abortion and congestion of the uterus and ovaries.

Treatment

The treatment of the intoxication resulting from this agent is that of other irritants: thorough lavage with warm water, followed by strong infusion of coffee, and the patient treated symptomatically. The effects of the drug are eliminated by the kidneys and hence particular attention must be given to increase the flow of urine and prevent suppression. Hot water baths, infusions of digitalis, or the employment of diuretin may be used to advantage. To stimulate the heart, use brandy, whisky, or aromatic spirits of ammonia, and treatment should be continued in cases tending to recovery until the urine becomes normal in color and quantity.

POISONING FROM SULPHONAL, TRIONAL—PARALDEHYDE

Occasionally sulphonal or trional fails to exert any hypnotic effect, and instead may cause, even in small doses, mental excitement, or active delirium, with nausea and vomiting, vertigo, headache, and exhaustion. The individual may stagger for several hours, as if intoxicated with alcohol. A scarlet rash has also been

observed; a number of cases of fatal poisoning from sulphonal, trional, and paraldehyde have been reported.

Symptoms

The patients may sleep for several days; the body becomes cold and livid; the lips and face cyanosed; finally general convulsions appear and death occurs during coma from respiratory failure. In many cases the chief symptoms are stupor, stertorous respiration, slow pulse, with general or complete anesthesia. The urine is always of a dark wine color, and the presence in the urine of hematoporphyrin is considered by many to be a fatal sign.

Treatment

Sulphonal and trional are absorbed slowly, hence in cases of poisoning, gastric lavage or emesis are necessary. Also a brisk purgative should be given before the withdrawal of the stomach-tube. As sulphonal is excreted by the kidneys, every effort should be made to have them act freely. Hot baths and enemas of warm water are useful for this purpose. It is also essential to render the urine alkaline as rapidly as possible, and for this purpose hypodermoclysis with a solution of sodium carbonate has been recommended. Adrenalin, with hot saline solution intravenously, and strychnine in full doses hypodermically, is recommended in desperate cases. Aromatic spirits ammonia or whisky proves beneficial as a general stimulant and later digitalin is often necessary to sustain the heart action in convalescence.

POISONING FROM VERATRUM VIRIDE (AMERICAN HELLEBORE)

Veratrum has a distinct action upon the heart, causing a very slow contraction of the cardiac muscles, and was formerly much in vogue in the treatment of fever by the older practitioners. It was and is now usually employed in the form of Norwood's tincture. In overdoses it causes intense nausea, with alarming symptoms of collapse. In some it acts also as a more violent irritant, causing intense pain in the abdomen, convulsions, insensibility, and death. Barthelow attributed death as due to asphyxia from

paralysis of respiration. A pustular eruption sometimes follows the employment of veratrum.

Treatment

Fetal effects are rare, despite the alarming symptoms produced by an overdose of veratrum, owing to its depressing effects on the vasomotor centers. Strychnine is considered the physiologic antidote and should be given hypodermically in $\frac{1}{30}$ - or $\frac{1}{40}$ -grain doses as deemed necessary. Emetics of mustard and hot water or gastric lavage should be employed. Apomorphine and other depressing emetics, only tend to increase the danger. Ergot, hypodermically administered, is also considered very effective, and for the collapse or exhausted condition, aromatic spirits of ammonia, coffee, brandy, etc., with enemas of hot saline solution should be given at regular intervals. Nitroglycerin and all vasomotor dilators are contraindicated.

POISONING FROM VERONAL

A number of deaths from veronal have been recently published in medical journals. The lethal dose in a healthy adult is assumed to be from 40 to 50 grains, although one death from a single dose of 10 grains is on record. Toxic symptoms following the administration of veronal are drowsiness, headache, and a peculiar, staggering gait. The patient falls into a deep sleep, from which he is aroused with difficulty. Symptoms simulate closely poisoning from opiates, except the pupils are usually dilated. The drowsiness, unless speedily overcome, passes into coma. The patient becomes cyanosed and respiration is rapid and stertorous. During this stage a marked rise of temperature is common, and a physical examination of the lungs reveals all the clinical signs of acute pneumonia with distinct areas of dullness, vocal resonance, bronchial breathing, moist rales, and crepitation, which are followed by edema and cardiac exhaustion. (Wilcox. *Lancet*, London, Oct., 1913.)

Treatment

If the patient is seen within the first few hours after taking the drug, the stomach should be thoroughly washed out with the aid

of a tube, and following this an ounce of castor oil, and a pint of hot coffee should be introduced before the withdrawal of the tube. Cardiac stimulants of strychnine $\frac{1}{20}$ grain, digitalin $\frac{1}{100}$ grain, or adrenalin should be given as required, with subcutaneous and rectal injection of hot normal solution at regular intervals. If cyanosis is marked and respiration embarrassed, inhalations of oxygen should be given, and warm, external applications applied to sustain the general situation. Retention of urine should be guarded against by use of the catheter when necessary.

POISONING FROM WORMWOOD, ARTEMISIA, ABSINTHIUM

Wormwood is not officinal. It contains a volatile oil and the glucoside absinthin. An alcoholic liqueur called absinthe, Americanized under the name of "Benedictine," is somewhat popular in France, used as an intoxicant and aphrodisiac. It contains the oil of wormwood and alcohol, highly flavored with aromatics. Its constant use produces disorders of the nervous system somewhat similar to cocaine, and renders the subject more or less a physical wreck. The state of nervous depression is frequently followed by tremors, epileptiform convulsions, stupor, delusional insanity, and fatal coma. Wormwood is used as a household remedy for worms, and as a tonic in indigestion and flatulence. A number of cases of poisoning have followed its employment. It is classed as a narcotic poison. The symptoms of acute poisoning are nausea and vomiting, headache, diarrhea and marked exhaustion, stupor, clonic muscular contraction, sometimes followed by fatal coma.

Treatment

Evacuation of the stomach by emetics or stomach tube, strychnine hypodermically, cold effusions or baths, followed by brisk friction of the skin, amyl nitrate and ammonia by inhalation, with aromatic spirits ammonia to counteract the viscosity of the blood. Hot, strong coffee, and saline solution subcutaneously, should be continued at regular intervals until all toxic symptoms disappear. Chronic absinthe poisoning is treated similarly to chronic alcoholism, with nerve tonics and restoratives.

CHAPTER XII

POISONING FROM ACIDS AND ALKALIES, AND ORDINARY POISONS

PRELIMINARY REMARKS

It is the duty of the physician always to be alert and to recognize symptoms due to poisons, whether administered with criminal intent, taken accidentally, or the result of decomposed food products or adulterated drugs. There is a wide variation in the effect of the same poison in different individuals. The size of the dose, the physical condition of the recipient, the method or avenue of administration, and especially the interesting but little understood matter of idiosyncrasy which so often plays a most important part in the poisonous action of drugs, as well as certain foods.

Symptoms of Acute Poisoning

The symptoms common to nearly all poisons are, first, vomiting and purging, gastric pain and intestinal irritation; second, vasomotor disturbances, marked decrease in blood pressure, with depressed heart action and respiration; third, cerebral symptoms, stupor, coma, convulsions, etc.; and fourth, motor disturbances, contracted or dilated pupils, wrist-drop, paralysis of the sphincters, retention of urine; and, fifth, sensory disturbances, anesthesia, hyperesthesia, peculiar speech, disturbance of sight and hearing; all of which, occurring suddenly in a normal and healthy individual, would naturally lead to suspicion of acute poisoning.

Diagnosis

So closely associated are symptoms of poisoning with those of disease that it is not plausible or possible to base a diagnosis of acute poisoning on any one group of symptoms. The history of the case is often of more importance than the symptoms. Bacterial infection generated in the food before or after it is taken into the stomach (like green apples) under certain conditions,

will produce just as violent symptoms, with gastrointestinal irritation, vomiting and purging, as a poisonous dose of arsenic or corrosive sublimate.

Again, exposure to heat or heat stroke, or carbon monoxide gas may cause vasomotor disturbances equivalent to poisoning by nicotine or vegetable alkaloids; and lastly, cerebral hemorrhage, or chronic nephritis may occasion stupor and coma, with convulsion, which closely resemble poisoning from narcotics, and hence a physician who makes a positive diagnosis of poisoning in the presence of chronic organic disease may find himself in a very awkward position. Therefore, in all cases of suspected poisoning, the history of the case, the general appearance of the patient, and the surroundings, should be carefully noted. The hands, face, mucous membrane of the lips, mouth, and throat should be inspected for marks of corrosive poisoning. The skin should be carefully examined for evidences of a small puncture or prick of a hypodermic needle. The vomited matter may reveal something of value from its appearance or chemical examination. The odor of the breath may give a clue in either poisoning or disease.

An examination of the urine is always highly important. The use of sulphonal or trional makes the urine a deep wine color; antipyrine and salol cause the urine to be of a dark red color; methylene blue, and carbolic acid, a dark green. Albumin in the urine is common to Bright's disease, but may be due to arsenic or other metal poisoning. Arsenic is easily detected in the urine by boiling a small quantity in a test tube with a small strip of polished copper; and lastly, the excretion from the bowels should not be neglected in suspicious cases.

The fact that a person in good health is suddenly taken ill within an hour or two after the taking of a meal or drink, should awaken suspicion of poisoning. This suspicion is intensified if others partaking of the same food become ill. The question then to decide is, whether the poison has been generated in the food by bacterial infection, or administered with homicidal intent.

Treatment in General

The first and most important thing is to remove from the stomach by lavage or vomiting any portion of the poison that has

not been absorbed. The fact that free vomiting has already occurred is no bar to washing out the stomach. In the absence of a stomach tube, a teaspoonful of mustard well stirred in a glass of warm water is generally most convenient and is always an effective emetic. The next step is to make an effort to neutralize the poison in the stomach by giving a proper antidote. (These are described more fully under the individual poisons.) As a general rule it may be well to remember that for alkaline or caustic poisons some weak acid, such as vinegar or lemon juice, should be used; for acids, a solution of common baking soda, or calcined magnesia may be employed; and in all corrosive poisons the whites of three or four eggs dissolved in a pint or two of water is always indicated, but should not be allowed to remain any great length of time in the stomach. The hypodermic or intravenous injections of aromatic spirits of ammonia, camphorated oil, or strychnine are indicated in heart failure, and artificial respiration with oxygen should be employed when there is impending failure of respiration. In many instances of pronounced poisoning, especially from ptomaines and narcotics, the direct transfusion of blood as practiced by Crile is destined to be of great service. Hypodermoclysis and proctoclysis are now conceded to be most valuable, if not indispensable adjuncts in the treatment of exhaustion, for the application of which methods the reader is referred to the discussion on surgical shock, page 94.

POISONING FROM ACIDS

The mineral acids, hydrochloric, phosphoric, sulphuric, nitric, chromic, and other like acids including acetic or concentrated citric and tartaric acids, act very similarly upon human or animal tissues, and the treatment for poisonous doses is practically the same.

Symptoms

The effects of all strong corrosive acids are very similar in their action. When taken into the mouth and swallowed, the symptoms come on immediately. In the very act of swallowing, the burning pain in the throat and esophagus down to the stomach is usually

agonizing, causing retching and vomiting of a bloody mucus. There is always difficulty in speaking and swallowing. The evidence of the corrosive action of the acid is always evident on inspecting the mouth and lips, or fauces. As the case advances, the skin becomes cold and clammy, respiration is embarrassed, the countenance or expression of the face is haggard, and the heart action rapid and feeble. The mind is ordinarily unimpaired to the last. Death usually occurs in a short time, varying from a few hours to a few days; the difference may doubtless be ascribed to the presence of a full or empty stomach at the time of swallowing the acid, or to the fact of its immediate rejection by vomiting. If the acid be taken in a diluted state, the effects are less prompt in appearance, and the degree of corrosion is less marked.

Should the individual escape the immediate fatal consequences, death may later result from chronic inflammation of the stomach, or perforation or stricture of the esophagus.

The Fatal Dose

One or two drams of any of the stronger acids are sufficient usually to cause the death of an adult, although there are several cases on record where recovery has taken place after swallowing two, three, or even four ounces of sulphuric acid, which is considered one of the most violent escharotics.

Treatment

The employment of a stomach tube in these cases is contraindicated according to many authorities. Others insist that owing to the immediate corrosive action of the stronger acids on the tissues, chemical antidotes can rarely be employed in time to prevent serious injury. But since it is often impossible to make the patient swallow, in consequence of the painful and corroded condition of the mouth and throat, in the author's judgment, it is safer and better to carefully and gently insert a medium-sized, well-oiled stomach tube and thoroughly wash out the stomach, the risk of perforation of the esophagus or stomach in the careful insertion of the tube being less dangerous than the liability of rupture or injury from violent retching or vomiting resulting

from the use of apomorphine or other emetics. Where there is excoriation of the mouth and fauces from acid or alkali poisons, keeping the funnel of the stomach tube filled with water or other fluid greatly facilitates its introduction.

The tube once inserted, the stomach should be washed with a solution of sodium bicarbonate, one-half ounce to the pint of water, in quantities of not exceeding one-half to one pint at a time, lest the stomach be dilated or perforated, and the washing continued until all reaction and eructation of gas ceases. After which, diluted starch, oil, milk, or whites of egg should be inserted before the removal of the tube. Barley water, linseed tea, thin gruels, or milk should be given at frequent intervals, and morphine sulphate given hypodermically as often as required to overcome the severe pain. In cases of threatened asphyxia, if not caused by fear or nervousness, tracheotomy may be required. In all cases it will be necessary to combat the secondary inflammatory symptoms with the usual appropriate remedies.

“Knock-out” drops, as used by thieves and kidnappers, and other criminals are composed chiefly of chloral hydrate, 25 to 30 grains to the ounce. It is usually incorporated with port wine, to which is added a little glycerin to disguise the taste. It is especially active in those partially intoxicated. It paralyzes the adreno-thyroid and vasomotor centers, causing a deep sleep or stupor, which quickly lapses into unconsciousness. Active vomiting by means of mustard and hot water, or gastric lavage is necessary, and strong, hot coffee should be introduced before the tube is withdrawn. Strychnine in full doses, hypodermically, or adrenalin in large doses with hot saline solution, intravenously, is often essential. Digitalis must be employed later to sustain the heart action during convalescence, and all vascular depressants are contraindicated. (Sajous.)

BURNS FROM ACIDS

SULPHURIC, NITRIC, HYDROCHLORIC, CARBOLIC

“Of the stronger acids, sulphuric seems the most powerful. When applied in full strength, it seems to char animal tissues and has a strong affinity for water. When applied to the skin, it acts

as a strong caustic, redissolving the coagulum form and penetrating deeply, turning the tissues black." (Shoemaker.)

Treatment

Burns resulting from contact with any of the stronger acids require very prompt treatment, especially if the face is involved. Soapy water may be used to wash off the excessive acid, after which, sterile gauze, wet with a saturated solution of sodium bicarbonate, should be freely applied until pain ceases and the acid is apparently neutralized. The following ointment will then be found to be very soothing and healing:

R	Orthoform	3 i
	Pulv. marantii	5 ss
	Lanolin q. s. ad.	5 ii
	M. ft. ungt.	

Sig.: Apply freely on sterile gauze, repeated every two or three hours.

In the more extensive burns from acids, resort should be had to applications of carron oil, as already described under the treatment of extensive burns and scalds.

Burns from carbolic acid require special treatment. Alcohol should be applied directly to the burned area on lint or cotton, and changed every 15 or 20 minutes for at least an hour, if the burned surface is extensive. The subsequent treatment is that of an ordinary burn. (See Carbolic acid, page 399.)

POISONING FROM ALKALIES

CAUSTIC POTASH AND SODA, CONCENTRATED LYE, ETC.

Many cases of accidental poisoning from caustic potash have been reported. When swallowed, it causes intense pain, with violent irritation to the throat and stomach, similar in action to the corrosive acids, and its destructive power on the mucous membrane of the mouth, throat, esophagus, and stomach is very marked; and secondary inflammation is more liable to lead to gastritis and stricture than from the acids.

Commercial caustic potash and soda in common use for domestic purposes, and known as "potash," "pearlash," "soda-ash," or

“concentrated lye” is very frequently taken and swallowed by little children, and it is this form of poisoning with which the emergency surgeon has to deal. According to Shoemaker, “Potassium is distinctively a cardiac poison; a nerve and muscle paralyzer through an influence upon protoplasm and its destruction of the ozonizing function with the red corpuscles, and these effects are shown to a different degree by the different salts of potash: nitrate, bicarbonate, bromide, chlorate, etc., and vary with the dose. Of the salts of potassium, the cyanide is the most toxic. death having resulted from two- to five-grain doses. Potassium ferrocyanide is decomposed by weak acids with liberation of hydrocyanic acid, and death has been caused by this mistake. The nitrate in large doses exerts a paralyzing influence upon the spinal cord, producing great muscular weakness and reduction of sensibility. Death has sometimes been caused by the nitrate in consequence of its irritant effect upon the gastrointestinal mucous membrane.

Fatal Dose

One to three drams of caustic potash is usually sufficient to cause death in an adult, the fatal dose depending more upon the degree of concentration than quantity.

Symptoms

Frequently the very acrid and nauseating taste of the lye causes it to be rejected from the mouth without being swallowed. Should it be swallowed, it causes immediately a burning sensation which extends from the throat to the stomach, very soon causing acute and violent pain, with excessive retching and vomiting of mucus mixed with blood. Otherwise the symptoms are identical with those of the corrosive acids. Should life be prolonged for a few hours, there is always more or less sloughing of the fauces and mucous membrane of the throat, with increased difficulty in swallowing or talking. Death results usually from cardiac paralysis in from two to four hours, or, should the patient recover from the acute symptoms, death may be deferred from four to six or eight weeks as a result of ulceration of the esophagus, or gangrenous sloughing of the stomach, duodenum or intestines,

or possibly from chronic nephritis, with total suppression of urine, death ensuing from uremia.

Treatment

If called within a half hour from the time the lye has been swallowed, a stomach tube may be safely introduced, but extreme care and gentleness is always required. Vinegar is considered the best chemical antidote, and the stomach may require repeated washing with a 50 per cent solution of vinegar and water before removal of the tube. If it is not considered safe to use the tube, the solution of vinegar by the mouth should be given and vomiting encouraged by the employment of apomorphine, $\frac{1}{6}$ grain, as required, hypodermically. The heart must be sustained with digitalis, and stimulants with or without morphine, as indicated. Lemon juice has been recommended as an antidote, and may be given with demulcents freely; and, lastly, following the employment of vinegar, olive oil may be given with great benefit. In the absence of this, milk may be used.

The after-effect of the poison may be anticipated and treated in the same manner described in poisoning from the corrosive acids.

POISONING FROM ANTIMONY: TARTAR-EMETIC—BUTTER OF ANTIMONY

Antimony is found in nature in a metallic state. In the earlier ages known as "stibuite," finely ground or pulverized, it was employed by women of the East for many centuries as a face paint for mourning, or for painting the eyebrows and lashes, to add luster to the eyes. Antimony was much used in the early centuries as a poison, but is now rarely, if ever, resorted to for that purpose. In the arts, antimony forms valuable alloys with other metals. Type metal is an alloy of lead, antimony and tin, and chronic poisoning, from which many printers suffer, is no doubt caused from the antimony as well as the lead. Antimony is now used in medicine principally in the form of potassium tartrate, or tartar emetic, and poisoning from this double salt is not now as common as formerly.

Tartar emetic is composed of tartaric acid in combination with

teroxide of antimony and protoxide of potassium. It occurs as a white powder or in large colorless octahedral crystals. Tartar emetic, as the name indicates, is a powerful emetic, and hence if a large amount is taken, it is usually expelled by vomiting, and consequently death does not result. However, a number of instances have been reported where large doses have been swallowed with total absence of vomiting and purging, the symptoms being intense prostration, cold, clammy sweat, a sense of oppression, the respiration at first increased, then diminished in frequency, a rapid, feeble pulse, intermittent and irregular; delirium, unconsciousness, and finally convulsions ensue, with rigidity of the limbs and jaws, preceding death.

Infants and children are especially susceptible to tartar emetic, and many fatal accidents from overdoses have been reported, following its employment as a popular remedy in croup and pneumonia. The fatal or lethal dose is indefinite and exceedingly difficult to determine. Two or three grains, when retained, have been known to cause death. Chloride or butter of antimony is a strong, corrosive poison, and several fatalities from its use have been reported, the symptoms being analogous to those caused by the strong alkalies or acids.

Chronic or Slow Poisoning

“Many cases have been reported in which death has undoubtedly been occasioned by small and repeated doses of tartar emetic. The symptoms are nausea, uneasiness, retching, occasional vomiting, diarrhea with pasty stools, the abdomen painful and distended, loss of appetite and emaciation, the tongue slimy, the mouth clammy. The head feels full and heavy. Later, there is slowness and loss of power in the heart’s action; the breathing is difficult; the complexion is dusty; there is stiffness of the legs, with great debility; the countenance is pale and anxious; there is a disposition to sleep, with inability to maintain the erect position; faintings, flushing of the face, and increase of urinary secretion.”*

*Reese: Manual of Toxicology.

External Application

"Tartar emetic not only occasions pustulation when applied to the skin, but is capable also of producing its poisonous effects on the system by absorption. Even fatal consequences have resulted from its application to abraded surfaces." (Reese.) The elimination of antimony by the kidneys commences very soon after it has been taken, and continues some time after discontinuing the poison.

Treatment

Gastric lavage and washing of the stomach with strong infusion of green tea or aqueous solutions of tannin with glycerin or alcohol, should be very thorough. Morphine, hypodermically, to relieve pain, and stimulants externally and internally, are demanded. The resulting inflammations must be treated on general principles.

POISONING FROM EMETINE HYDROCHLORIDE

Poisoning from emetine hydrochloride, a remedy now so promiscuously employed, has recently been reported.* The toxicity, according to Levy and Rowntree, resulted from impurities and adulterations employed in its manufacture. It is a matter therefore of great importance in prescribing this remedy that the physician be assured of its purity.

Two cases from the Johns Hopkins Medical Clinic are reported in which symptoms of poisoning and in one instance death resulted from the administration of emetine hydrochloride. The fatal case occurred in a man afflicted with amebic dysentery. He was treated for twenty days by subcutaneous injections of emetine, the daily dose being $1\frac{1}{2}$ grains. The total amount injected was 29 grains. The diarrhea improved at first but after a few days treatment became intensified. From the sixteenth day grave kidney symptoms developed marked acidosis, renal insufficiency hematuria, etc. Bronchopneumonia supervened, followed by the death of the patient ten days after the last emetine was administered. The other patient was a woman, who was undergoing treatment

*Arch. Int. Med., 1916, xvii, 420.

for pyorrhea alveolaris. She was given $\frac{1}{2}$ grain daily subcutaneously for four days. She developed a severe diarrhea with intense pain and tenesmus. These symptoms cleared up six days after the withdrawal of the emetine, but the patient remained in a toxic delirious state for several days. The symptoms so out of proportion to the small amount used, led to a research to determine the cause of the toxicity of this special preparation and later adulterations were established in five other commercial preparations of emetine which caused marked toxic symptoms in animals to whom it was administered.

Symptoms

The toxic symptoms or danger signals following the employment of emetine are intense diarrhea, abdominal pain and tenesmus, albuminuria, and peripheral nephritis, which (according to the same authority, Levy and Rowntree) symptoms or toxic effects may possibly deceive the attending physician, in so much that they closely resemble the symptoms of acute dysentery, the very disease for which emetine is so highly extolled, or in other words the toxic symptoms may easily be confused or misinterpreted as belonging to the preexisting morbid condition.

Treatment

Withdrawal of the remedy, morphine to control the pain, with stimulants to prevent collapse, are the chief indications.

POISONING FROM ARSENIC

Of the various forms of arsenic, the white, or tetroxide of arsenic or arsenous acid, is the most important so far as the physician is concerned, while rough-on-rats (which is supposed to contain 50 per cent arsenic), Paris-green, Screel's green, and lastly Fowler's solution, are the most important from the toxicologic standpoint. In the arts (Reese) "arsenous acids enter into numerous compounds, as in the manufacture of glass and of white enamel. Composition candles sometimes contain it. It is employed to prevent 'furring' in steam boilers. Ship-builders mix it with tar to protect timber from worms. It is sold in

powder form for destroying rats and other vermin, and is an ingredient in fly paper. It is used also in the coloring of wall paper. Farmers use it to preserve grain for seed and in solution for sprinkling plants. Grooms give it to their horses to improve their coats, and the peasants of Syria, as also the inhabitants of other mountainous countries, habitually take arsenic for the purpose of rendering themselves capable of greater physical endurance." Arsenic is nearly tasteless. Its solubility in water is very slight, but much increased by the addition of an alkali, and, combining with alkalies, forms a soluble arsenate.

Symptoms

A poisonous quantity of arsenic taken at one time will usually within an hour produce violent gastrointestinal symptoms of irritation. There is at first a sense of faintness and a feeling of heat or suffocation, with constriction of the throat, soon followed by nausea and vomiting, with burning pains in the stomach. The pain soon becomes excruciating, and excessive vomiting and purging rapidly ensues. The vomited matters are frequently streaked with blood, and the pain rapidly extends over the whole abdomen. Symptoms of profound exhaustion are now manifest. The temperature is usually subnormal. The features are pinched and pallor pronounced; the pulse is small, rapid, and irregular; there is intense thirst; the eyes are red, the tongue dry, and the mouth parched; the breathing is difficult and labored. Frequently there are violent cramps in the legs and arms; the urine is suppressed; stupor, delirium, and convulsions soon occur, followed by collapse and death by coma.

Such at least is the usual clinical picture where death proves rapidly fatal, but cases of poisoning from arsenic vary so greatly in character and so many unaccountable and peculiar symptoms are apt to arise, even where taken in fatal doses, as often to render the diagnosis very difficult. In one class of cases the symptoms are those of extreme collapse, in which there is little or no pain and no vomiting. The patient becomes cold and clammy; the pulse rapid and thready, and the mental faculties may not in the least be impaired, but death without reaction occurs in three or four hours.

Again, in another class of cases, the most violent or acute symptoms may suddenly cease, a pronounced intermission, as it were, so marked that hopes may be entertained for a rapid recovery, but after a few hours, all symptoms return in an aggravated form, and death speedily ensues. Christiansen mentions a case of sudden and unaccountable remission of symptoms, followed by death on or about the sixth day. There are a number of cases reported on excellent authority where death took place within four hours without any history of pain or vomiting, and according to Reese, "Variations in symptoms of poisoning from arsenic occur under large and small doses, and they can not be accounted for by the quantity, form, or mode of administration of the poison."

The time when symptoms are first manifest also varies greatly. Ordinarily they appear within half an hour or an hour; the time may, however, be protracted for many hours after taking the poison. The discrepancy is explainable in part by the condition of the stomach at the time of receiving the poison. If swallowed on a full stomach, its action is often delayed for a few hours. External application of arsenic, when applied to abraded surfaces, is known to have caused fatal poisoning, and it has likewise proved fatal when applied to the mucous membrane of the vagina and rectum. Death from the external application of arsenic presents all the usual characteristic symptoms of burning and constriction of the throat, thirst, vomiting and purging as if taken in the stomach.

Fatal Dose

It is generally conceded that one to three grains of arsenous acid is sufficient to prove fatal to an adult. Taylor relates a case where two grains of the poison given in the form of Fowler's solution in divided doses during a period of five days destroyed the life of a woman. The author recalls a fatal case where a child of two years died after drinking the water out of a plate wherein had been placed some flypaper, and another case where about one-half teaspoonful of rough-on-rats taken with suicidal intent, proved fatal to an adult within four or five hours.

Prognosis

Owing to the variety and peculiar symptoms resulting from poisonous doses of arsenic, the prognosis must always be guarded (even in apparently favorable cases, with a negative examination of the urine) until the patient survives 18 to 20 days, after which period all authorities agree that the arsenic temporarily deposited in the various organs and tissues of the body should be eliminated.

Treatment

Empty the stomach by means of gastric lavage and wash it out thoroughly with warm water (under no circumstances use alkaline solutions, such as sodium bicarbonate or magnesium), and follow this immediately with tablespoonful doses of hydrated sesquioxide of iron, always given in a moist state. In the absence of a stomach-tube, thorough emesis must be established by means of mustard and warm water, or apomorphine, $\frac{1}{8}$ grain, hypodermically. Soon after administering the antidote, a purgative dose of one or two ounces of castor oil should be given with a view to thoroughly cleansing the intestinal tract of all remaining poison.

The hydrated sesquioxide of iron may be prepared by diluting tinct. ferri. chloride with one-fourth part of water and adding aqua ammonia, which precipitates the sesquioxide. Pour off the fluid and wash the precipitate by adding fresh water two or three times, then give the washed precipitate in tablespoonful doses, always repeating the dose after the patient vomits.

The sesquioxide of iron is still recognized as the best antidote. Hydrate of magnesia or Phillip's milk of magnesia, if freshly prepared, is considered by many chemists a reliable antidote.

The exhaustion and inflammatory conditions developing later must be treated on general principles. After thorough lavage and purgation, diffusible stimulants such as aromatic spirits of ammonia, with morphine and atropine (where there is excessive vomiting or pain) may be given with great benefit.

Toxic gastritis and enteritis are especially common after poisoning with arsenic, the most prominent symptoms of which are

loss of appetite, distress or fullness after eating, with paroxysms of severe pain or persistent vomiting. Achylia gastrica, with pernicious anemia may also develop as a result of the destruction of the peptic glands of the stomach, and ulceration of the duodenum is also common.

In such patients the indications are: First, to stimulate gastric secretions. For this purpose fluid extract condurango, 15 to 20 drops, or tincture nux vomica, 5 to 10 drops, with hydrochloric acid, 10 to 20 drops, in water, after meals, is recommended. Second, to aid digestion and assimilation of food, for which purpose pancreatin, 5 grains, sodium bicarbonate, 10 grains, with taka-diastase, 5 grains, after meals, is highly extolled.

Diet is also of great importance. Liquids are preferable. Soups from meats, Valentine's or Liebig's beef juice, rice or sago gruel, corn meal mush, soft boiled eggs, raw eggs with milk, koumiss, Matzoon, cocoa, tea or coffee, well diluted with milk, can also be given. Alcoholic beverages are, in the author's judgment, objectionable, though some allow them in moderation.

In cases of severe anemia, rest in bed, and peptonates of iron or other good iron preparations should be given. Subnitrate of bismuth, 15 to 20 grains, or orphol, 5 to 15 grains, should be given if diarrhea is present, and lastly urotropin 5 to 10 grains combined with an equal quantity of benzoate of soda may prove especially valuable if chronic nephritis is present.

POISONING FROM BROMINE

Bromine does not exist in a free state; it is obtained for commercial purposes from sea water, or from the so-called "mother liquors" of many salt works. It is a heavy, brownish red, volatile liquid, possessing a pungent, unpleasant odor. The vapor is injurious to the eyes and lungs. Bromine is an irritant poison and a powerful narcotic. It is now rarely used for medical purposes. In pharmacy it is employed as a test solution; in bromine water, 1 c.c. to 100 c.c., and in the manufacture of the various bromides; it is used extensively in the arts, especially photography, and in making of certain aniline dyes.

Symptoms

When taken into the stomach, bromine causes symptoms similar to other irritant substances—intense burning in the throat and stomach, followed by vomiting, purging, collapse, and death.

Treatment

Efforts at elimination by gastric lavage followed by ammonia water well diluted, maintenance of bodily temperature by artificial heat, morphine and atropine to control the pain, with strychnine and other heart stimulants as indicated, are the essential features of the treatment.

POISONING FROM BROMOFORM

Bromoform is a colorless liquid having a chloroform odor and sweetish taste, soluble in ether and alcohol. It is a distillate obtained from a mixture of chlorinated lime, potassium bromide, and acetone. The dose for internal use is 1 to 5 drops. Death has resulted from taking 20- to 40-drop doses.

Symptoms

When an overdose of bromoform is taken, it produces a hysteric or laughing intoxication, followed by nausea and vomiting, loss of the reflexes, cyanosis of the face or extreme pallor, and vertigo; delirium, convulsion, or possibly collapse and coma, with cardiac exhaustion, may ensue.

Treatment

Alcoholic stimulants should be administered, artificial heat applied, and hypodermic injection of ether, camphor, or strychnine should be administered to stimulate the heart and circulation. Usually the effects of the drug pass away and the patient returns to consciousness in from four to six hours.

POISONING FROM CASTOR OIL BEANS OR SEEDS

Castor beans or seeds contain a powerful irritant poison. Two or three of the seeds, when chewed and swallowed, act as a most drastic cathartic, and have occasioned death in several instances.

According to Reese, three seeds have destroyed the life of an adult male in 46 hours. Again, in another reported case, 20 seeds proved fatal to a young lady in five days. Violent purging and vomiting, cold skin, wiry pulse, abdominal pains, intense thirst, and collapse, with symptoms, in fact, closely resembling malignant cholera, appear. The poisonous principle is known as "ricin," and belongs to the toxalbumins. Symptoms of poisoning are those of the violent irritant to the gastrointestinal tract, causing inflammation of the stomach and intestines, as well as to the mucous membranes of the biliary tract and kidneys.

Treatment

Treatment consists of early elimination by means of emesis, or preferably gastric lavage and flushing of the bowels with the colon tube. Demulcent drinks of elm bark or flaxseed, large and repeated doses of bismuth subnitrate to overcome the intestinal irritation, with hypodermics of morphine to control the pain and tenesmus, and lastly saline solution by hypodermoclysis to prevent exhaustion.

POISONING FROM COPPER—BLUE VITRIOL, VERDIGRIS, ETC.

All salts of copper are poisonous. The sulphate or blue vitriol and the acetate or verdigris were formerly much employed in the treatment of supergranulation or proud flesh, also much used as a wash in suppurative cases, and as an emetic. Many cases of poisoning, supposedly from cooking in copper utensils, are now known to have been from ptomaines or from unwholesome fermentation in the food itself, hence, cases of accidental poisoning by copper are now comparatively rare.

Symptoms

In large doses blue vitriol or verdigris speedily produces violent vomiting, headache, pain of a colicky character, and purging. There is likewise a sense of strangulation in the throat, with a copperish taste. The pulse is described as being tense, small and irregular. There is usually great thirst and scarcity of urine;

cramps in the limbs, and convulsions are common. Death usually does not follow for several days after taking the fatal dose, resulting more often from the secondary action of the poison in the stomach and the intestinal tract.

Treatment

Free vomiting or gastric lavage, followed by albumen in the form of eggs, and later on milk, should be freely given. Laxatives of castor oil following the inhibition of milk is considered the most effectual way to eliminate the poison. Morphine and diffusible stimulants are usually required, and later, large doses of bismuth subnitrate with tonics and restoratives, are necessary to recovery.

POISONING FROM INK OR WRITING FLUID

The best black ink or writing fluid is composed of a solution of tannin, crystal gallic acid, and sulphate of iron or green vitriol. Hydrochloric acid is employed for the purpose of holding the iron in suspension, and carbolic acid is added to prevent molding. Colored liquid solutions of ink, made up with aniline and other dyestuffs are used in the manufacture of the cheaper grades of ink. For copying purposes a special ink is made from logwood, alum cake, and chromate; while printer's ink is a linseed oil varnish, to which the desired color is imparted by the use of lampblack or some other coloring matter.

A few cases of poisoning occurring in small children from ordinary writing ink have been reported.

Symptoms of Poisoning

The symptoms of poisoning from ink are somewhat dependent upon the amount taken. Tannogallic acid has a decided local astringent effect upon the tissues and the taste is such that it is rarely swallowed by children. When swallowed, it constricts the blood vessels, decreases the vascularity of the parts it comes in contact with, and also coagulates the albumin. The ferric sulphate is likewise an astringent, and, combined with the gallic

and hydrochloric acid, acts as an irritant to the stomach and intestinal tract.

The usual symptoms, therefore, after taking a quantity of ink, are constriction of the muscles of the mouth and pharynx, nausea and vomiting, and pain in the stomach, but the prostration is not marked, and the bowels are constipated.

Treatment

Gastric lavage is always required, and the stomach should be washed out repeatedly with a 5 per cent solution of citrate of potash until all discoloration or evidence of ink is removed. Albumen in the form of whites of eggs should be introduced into the stomach and siphoned out, after which demulcent drinks in the shape of flaxseed or elm bark tea, mucilage or gum acacia, etc., may be freely administered. Later, castor oil should be given as a laxative. Aromatic spirits of ammonia or alcoholic stimulants may be administered as indicated.

POISONING FROM INDELIBLE INK

Indelible ink, used in marking linen, etc., has been the cause of several deaths among little children. Its toxic property is due to silver nitrate.

Symptoms

The effects are local at first, with marked irritation of the pharynx, esophagus, and stomach, followed by violent abdominal pain, with widespread symptoms of gastroenteritis, marked pallor and exhaustion, with later cyanosis and convulsions.

Treatment

Chloride of sodium—common salt—is the chemical antidote, and should be given by means of the stomach-tube in large quantities and siphoned out, and this procedure repeated several times. Nitroglycerin should be given hypodermically at stated intervals, to sustain the heart, and sodium bromide with chloral hydrate to reduce the sensibility of the mucous membrane and control the nervous symptoms. Lastly, “hot saline solution given intravenously, not only acts as a chemical antidote in the blood, but by

diluting the latter, prevents the irritating action of the poison on the vasomotor centers." (Sajous.)

POISONING FROM JEQUIRITY—WILD LICORICE

Cases of fatal poisoning from eating the seed or beans of jequirity have been reported. The seed or beans are bright red in color, with a black spot at the hilum. They are extremely poisonous. One bean has been known to cause the death of an adult. The toxic elements are thought to be an albumose and a globulin, and closely resemble ptomaine poisoning of bacterial origin. The effects of the poison are also said to be almost identical with that produced by the venom of the cobra. Jequirity is not used internally as a medicine, but is employed locally in ophthalmic practice, especially in the treatment of trachoma, or granulated lids, keratitis, etc. Its careless use has led, according to Murrell, to stricture of the nasal duct.

Symptoms

The toxic effects are said to develop rapidly—nausea, and vomiting followed by extreme exhaustion, diarrhea, tenesmus, intense thirst, headache, rapid pulse, and cyanosis. The temperature is usually subnormal, and death is due to cardiac and respiratory paralysis. Diffuse nephritis and hemorrhages in the mesenteries have been found. Hypodermic injections of even mild solutions are said to produce local gangrene, and the blood remains fluid after death. (Martin.)

Treatment

Gastric lavage, followed by the most powerful heart and general stimulants are called for. Amyl nitrate, by inhalation, sustained by adrenalin and pituitrin extract, with ether or camphor hypodermically have been recommended, but the physiologic antidote has not been determined.

POISONING FROM KEROSENE—COAL OIL

Coal oil or kerosene is a distilled product of petroleum. Its general employment for illuminating purposes and carelessness

in its handling renders it liable to be taken by children and a number of cases of fatal poisoning have been reported. In doses of one ounce or more it causes nausea and vomiting with prostration and tetanic convulsions, which may cause death. The lethal dose varies from one to four ounces. The author has had a number of cases of poisoning from kerosene, of which the following illustrates the character of the symptoms:

A child three years of age swallowed an unknown quantity of kerosene; the oil was kept in a coffee cup by the mother for the purpose of starting the morning fire. As near as could be estimated, the amount taken did not exceed one ounce. The patient was seen about an hour subsequent to taking the kerosene; vomiting had been profuse, followed by purging. The temperature at the time I saw the child was 97° , the surface of the body cool, with evidences of cyanosis, pulse 130, feeble and intermittent; respiration was labored and irregular, and there was a marked tendency to coma. There were also occasional twitchings of the muscles of the face and hands; the throat and mouth revealed patches of congested areas. Through a large soft rubber catheter I was enabled to wash out the stomach, after which milk was freely given with alcoholic stimulants. The patient was wrapped in a warm blanket and surrounded with artificial heat, enemas of hot salt solution given, and retained by local pressure. Two or three drops of amyl nitrate were given by inhalation, and later a hypodermic of 20 drops of aqua camphor was given. The pulse continued very weak for some time, but the child ultimately made a good recovery.

Treatment

Emesis with mustard and water, or gastric lavage, is always essential. Inhalations of amyl nitrate or ammonia may be employed to keep up the heart action. Milk, with brandy or whisky should be given, and artificial heat is required to keep the patient warm. Warm saline rectal enemas will assist materially in strengthening the patient. Demulcent drinks of elm bark or flaxseed with bismuth subnitrate to allay the stomach and intestinal irritation are generally called for, and later, tonics and restoratives should be given as indicated.

POISONING BY MERCURY

Mercury in its metallic form is not regarded as a poison. It has frequently been administered in the treatment of constipation and certain affections of the liver, in which it is supposed to act with benefit by virtue of its gravity and liquid form. Blue mass, or blue pill, formerly so much in vogue, contains 33 per cent of mercury. Mercurial or blue ointment contains 50 per cent mercury; whereas, calomel contains about 25 per cent. In former times it was considered essential to "touch the gums" or produce ptyalism in order to obtain therapeutic results. This practice is now obsolete, and consequently ptyalism from mercury is now rarely seen.

Artisans who work in metals, such as smelters of the ores, looking-glass platers, water gilders, and barometer makers, are very liable to become poisoned by the fumes. The symptoms of this sort of poisoning sometimes commence suddenly and at other times come on gradually, and they may or may not be accompanied by salivation. The general morbid condition thus induced is termed "mercurial tremors," shaking palsy, and tremblement mercurial. The upper extremities are commonly first affected, and then by degrees all the muscles of the body. There is a general unsteadiness of motion in the arms and legs, so that the patient can not grasp any object or plant his foot firmly on the ground. In bad cases, the victim can neither speak, nor masticate his food. If the disorder is not checked, it proceeds to fatal termination, attended with a loss of memory, insomnia, and delirium. Another curious symptom, not generally recognized, although very constantly present, is a brittle state of the teeth, causing them to chip.

The proper preventive treatment of this affection consists in cleanliness and good ventilation, together with the free use internally of albumen in the form of white of eggs.

All the compounds of mercury are more or less poisonous, but poisoning by corrosive sublimate is the most frequent.

POISONING FROM CALOMEL

Calomel in unknown and somewhat liberal doses is not only employed by physicians in a somewhat careless manner, but is

also freely used by the laity and dispensed over the counter in any quantity without prescription. Instances of poisoning from calomel are not rare. Witthouse and Becker (Medical Jurisprudence and Toxicology) report the case of a boy of fourteen, who died in three weeks from the secondary effects of six grains of calomel. Bufford and Lane* cite a case in which a young lady took as a laxative fifty-six calomel tablets in the course of five days. Toxic symptoms were pronounced. Throat and mouth swollen and sore, gums red, salivation marked, swallowing difficult, diarrhea, etc. Recovery followed appropriate treatment. Hartman† reports a fatal case of poisoning from five cents worth of calomel purchased for a laxative. The amount of calomel taken was estimated about sixty grains. Despite energetic and persistent treatment the young man (a negro) died in twenty-six hours after taking the calomel.

Commercial calomel in bulk form is very likely to contain corrosive sublimate, since calomel decomposes slowly when exposed to sunlight, forming mercuric chloride. Decomposition is more rapid in the presence of table salt and other alkaline chlorides.

Treatment

Poisoning from calomel is practically the same as that from corrosive sublimate. Early elimination, gastric lavage, saline purgatives, and supportive treatment is essential. A little care in prescribing and proper attention to secure elimination would avoid all toxic effects.

POISONING FROM CORROSIVE SUBLIMATE

Corrosive sublimate is used in medicine internally as a powerful alterative and externally as a germicide or antiseptic, and in the strength of 1:1000 it is in many respects, especially when combined with an acid medium, the most powerful germicide we possess. When taken internally in large doses, it is a powerful poison, and despite the fact that it is now the universal custom to prescribe corrosive sublimate in tablet form combined with meth-

*Jour. Am. Med. Assn., July 10, 1915.

†Med. Fortnightly, Aug., 1915.

ylene blue or some other coloring matter, nevertheless, it is a dangerous drug for common employment, as the tablets possess at first a slightly sweetish taste and are attractive in appearance to children, and hence readily taken in error.

The smallest dose reported to have destroyed life is three grains. Taylor considers that under favorable circumstances from three to five grains or even less, would destroy an adult. Very large doses having been taken with impunity, have been speedily vomited or neutralized promptly by antidotes.

The shortest fatal period on record is that of a case, reported also by Taylor, in which death occurred in less than half an hour from an unknown amount of this poison. However, life may be protracted from one to six or eight weeks, resembling closely poisoning from arsenic, the fatal period being variable, death in delayed cases being the result of ulceration or destruction of the peptic glands, and perforation of the stomach, stricture of the esophagus, chronic hepatitis, intestinal lesions, hyperemia, hemorrhage and necrosis, or lastly, chronic nephritis with necrosis of the renal epithelium, etc.

The external application of corrosive sublimate has sometimes been followed by fatal consequences, and it is a remarkable fact that in such cases both the symptoms and the postmortem lesions resemble very closely those attendant upon an ordinary case of poisoning by swallowing. Vidal reported a case of a woman aged 28 who had applied to the surface of her body an alcoholic solution of corrosive sublimate instead of liniment. Besides intense inflammation of the skin, there were several large blebs upon different parts of her body. There was bilious vomiting, which was afterwards tinged with blood; a severe diarrhea of dysenteric character, cramps, extreme anxiety, and great pain in the abdomen; later, suppression of the urine, swollen and bloody gums, together with a bluish line at the junction with the teeth. Cerebral symptoms appeared on the sixth day, together with extreme exhaustion, and death occurred on the ninth day.

Other cases of fatal poisoning resulting from the application of corrosive sublimate are on record. In one, the subject was a child, who died in about a week, after suffering the severest constitutional effects. In two others, also children, aged respectively

seven and eleven years, an ointment composed of two drams of corrosive sublimate to an ounce of tallow, was rubbed upon the scalp for the treatment of porrigo favosa. Excessive local irritation immediately ensued, and in forty minutes the children were delirious. They vomited continuously a greenish colored matter, and had great pain in the bowels, with diarrhea and bloody stools. In the younger child there was complete suppression of the urine. Death occurred in one on the seventh and in the other on the ninth day. There was no ptyalism.*

Symptoms

These generally come on immediately or very soon after the poison is taken. A nauseous, metallic taste is perceived in the act of swallowing. There is a sense of heat or constriction in the mouth and throat, nausea and violent retching, vomiting of mucous matter frequently tinged with bile and blood, and pain in the abdomen, which usually is swollen and tender to the touch; there is severe purging, sometimes of bloody matters, accompanied with tenesmus as, in dysentery; great anxiety; flushed and swollen countenance, though sometimes it is pale and anxious. The pulse is small, frequent, irregular, and is scarcely perceptible when the symptoms become aggravated. The tongue is white and shriveled, the skin is cold and clammy, the breathing difficult; there is also intense thirst, scanty or suppressed urine, cramps of the extremities; followed by stupor, fainting, convulsions, and death. The external parts of the mouth are found to be swollen, and often present a white appearance, as if the cavity had been washed with a solution of nitrate of silver; the lips are often swollen. In cases that do not prove rapidly fatal, salivation is usually superadded, as well as the painful train of nervous symptoms caused by the specific impression of mercury on the system.

There are occasional exceptions to some of the above mentioned symptoms of poisoning by corrosive sublimate: Thus, there may be an absence of abdominal pains, and also of vomiting and purging, and cases are reported in which the pulse underwent no change until just before death. In some instances the symptoms partially remit.

*Wharton and Stille: Medical Jurisprudence, 1873, ii, 407.

This poison differs from arsenic, according to Taylor,* first, in having a well-marked taste; second, in producing violent symptoms in a few minutes; third, the evacuations are more frequently mingled with blood. If the patients survive several days, the symptoms resemble those of dysentery—violent straining, and shreds of bloody mucous in the discharge from the bowels being frequently noticed.

Treatment

Early elimination of the poison from the stomach and bowels is essential to recovery. If free vomiting has not occurred, gastric lavage should be employed to wash out the stomach, warm water being used abundantly, promptly followed by albumen in the form of whites of raw eggs introduced before the stomach tube is removed. This form of albumen is conceded to be the best of all known antidotes and has stood the test of many years of experience. The white of one egg is regarded as sufficient for three grains of corrosive sublimate. An excessive amount of albumen is not desirable. It is much safer, after giving the whites of three or four eggs, if retained longer than ten or fifteen minutes, to again evacuate the stomach, and after this repeat the albumen. Castor oil, one or two ounces, should be given, preferably through the stomach tube, as early as possible, to remove the poison from the intestines. Numerous chemical antidotes have been suggested; some of which are iron filings and gold dust, protosulphide of tin, solutions of tannin, etc. They are not ordinarily easy to obtain, and are not in any way superior to the raw whites of eggs. Hydrated protosulphide of iron, if it can be administered within twenty minutes after taking the mercuric chloride, is said to be an efficient antidote (Potter). In advanced cases of poisoning Wilms† commends the intravenous injections of calcium sulphide grain for grain. Lambert and Patterson, reporting a series of sixteen cases of poisoning from mercuric chloride with but two deaths, summarize their treatment as follows:‡ The stomach is washed out twice daily. Colonic flushings night and morning, followed by rectal enema of a solution of 1 ounce of potassium

*Taylor: On Poisons, p. 39.

†Jour. Lab. and Clin. Med., i, 879.

‡Arch. Int. Med., Nov., 1915, p. 895.

acetate to 16 ounces of boiled water. Eight ounces of fresh milk is given by the mouth every two hours, alternated every two hours with 8 ounces of the following mixture:

R Potassium bitartrate	3 i
Sugar	3 i
Lactose	3 ss
Lemon juice	fl℥ i
Boiled water ad	fl℥ xvi
M.	

The prolonged secondary symptoms, extreme prostration, hectic fever, fetid breath, swollen gums, pyalism, with evidence of gastritis, enteritis, hepatitis, or nephritis, may be sought and treated on general principles as recommended on page 42 in the treatment of poisoning from arsenic. Potassium iodide, in 5- to 10-grain doses is recommended as an internal antidote, and should be continued for some time. Cardiac stimulants, morphine and atropine hypodermically, and demulcent drinks are also necessary, as well as hot packs and artificial respiration in pronounced cases.

Carter's Treatment

Professor C. A. Carter suggests the following method of treatment for poisoning from corrosive sublimate: Following the administration of egg albumen and gastric lavage, he advises giving 5- to 10-grain doses of sodium phosphate for each grain of corrosive sublimate taken. Where there is doubt as to the amount taken, keep the sodium phosphate in excess. The antidote, after being dissolved in hot water, may be given with egg albumen every hour during the first twelve hours. No food is allowed during this time. He also advises giving five grains of sodium acetate dissolved in half a glass of water every hour to act as a diuretic. The patient is also given one-half to one ounce of saline laxative each morning to assist in alvine elimination. After twelve hours the diet of egg albumen is substituted for milk and broths or soups.

The free use of water containing sodium bicarbonate, 1 dram to the pint, should be given to facilitate elimination of the poison by the kidneys. Efforts to remove the poison from the system by means of electrolysis are more sensational than practical. Mor-

phine, strychnine, and other vasoconstrictors and saline solutions are contraindicated.

POISONING FROM OXALIC ACID

Oxalic acid exists, in combination with lime and potash, in several vegetables, especially rhubarb, or pieplant. It is a compound of carbon and oxygen, with the elements of water. It is sometimes called the acid of sugar, because it is produced by the action of nitric acid on sugar or starch. It is a solid, white, crystalline substance, bearing a considerable resemblance to Epsom salts (sulphate of magnesia), and white vitriol (sulphate of zinc). It has an intensely sour taste, by which it may easily be distinguished from these substances. It is considerably employed in the arts and has frequently been the cause of accidental death, from having been mistaken for Epsom salts. It has also been frequently taken for suicidal purposes, and occasionally it has been administered homicidally. Its intensely sour taste would usually lead to its immediate detection.

A case is reported in which it was administered with criminal intent in buttermilk with fatal results.

Symptoms

These depend very much upon the size of the dose, and the degree of concentration. When swallowed in a large dose, half an ounce, dissolved in a small quantity of water, the effects are immediate and violent. An intensely sour taste is speedily followed by a burning sensation in the esophagus, extending to the stomach. There is also a feeling of constriction of the throat. Vomiting soon follows, sometimes of a bloody mucous, but generally of a greenish brown or black grumous matter, and if the patient survives some hours, there is purging of a similar character. The remaining symptoms are those of collapse, extreme debility, pale and anxious countenance, cold and clammy skin, small and frequent pulse, and hurried respiration. There are also soreness of the mouth, inflammation and swelling of the tongue, painful deglutition, intense thirst, restlessness, difficulty of breathing and distressing cough. Besides above symptoms, there are frequently

cramps and numbness of the legs and arms, acute pain in the back and head, delirium and convulsions—symptoms which indicate the very decided action of the poison upon the nervous system.

As in the case of other violent poisons, the above mentioned symptoms are subject to many exceptions and anomalies. Thus, cases are reported in which pain and vomiting have both been absent; or vomiting has not occurred until emetics were administered.

The general symptoms of oxalic acid poisoning are undoubtedly those of the irritants, but it may be so diluted as to lose all its irritant and corrosive properties, and yet prove fatal from its remote specific effects upon the heart and nerve centers. The latter impression is evidenced in the acute pains in the back, extending down the limbs, the tetanic spasms, the numbness and tingling in the limbs approaching to paralysis, and also the occasional narcotic effects observed. In this respect it differs from the mineral acids.

Fatal Dose

Oxalic acid, when taken in a full dose and in a concentrated state is one of the most energetic poisons known. The majority of fatal cases succumb within a few hours. Numerous cases have been reported in which death did not occur for several hours, and even days.

Treatment

The proper antidotes are chalk, and magnesia, or its carbonate, suspended in water or milk. These act by forming insoluble and inert earthy oxalates. The alkalies, carbonates of sodium or potash are inadmissible, since the alkaline oxalates formed thereby are nearly as poisonous as the acid itself. After thus neutralizing the poison, lavage of the stomach, or free vomiting should be encouraged by means of dessertspoonful doses of mustard, or 20-grain doses of sulphate of zinc dissolved in an ounce or two of water, repeated, if necessary, every twenty minutes until free emesis results. This should be followed by mucilaginous drinks with plenty of water. Limewater and oil may also be employed to great advantage. Hot enemata of normal salt solutions with hot fomentations to the abdomen and general cardiac and diffusible

stimulants are indicated in collapse, and are best used hypodermically; to be followed later by tonics and restoratives. Proctolysis is often of great value, and strychnine in full doses is often indispensable.

TOBACCO POISONING

Poisoning from tobacco may be acute or chronic and is due to the absorption of nicotine, a volatile liquid alkaloid of an oily consistence. Tobacco is a narcotic poison.

Symptoms

If even a small quantity of tobacco is swallowed by any one unaccustomed to its use, it soon produces very decided poisonous symptoms, headache, vertigo, nausea with severe retching, distress in the stomach, marked prostration, or a deathly feeling of exhaustion, cold, moist skin, trembling of the limbs and sometimes severe purging. The pulse is weak and rapid, breathing difficult, and syncope, convulsions, and fatal coma may ensue. The pupils are rarely affected and this condition is considered one of the characteristics of tobacco or nicotine poisoning.

The external application of tobacco formerly so often resorted to in the cure of eruptive diseases, has been known to have caused death. Chewing, as well as smoking, tobacco, to the novice or beginner, produces equally violent symptoms and sometimes fatal effects. The rapidity of the poisonous action of tobacco on the human system is sometimes remarkable.

Taylor* reports a case where an unknown quantity of snuff swallowed in whisky caused the death of an adult, in less than one hour. Beck† reports a case where an enema of tobacco given for the destruction of pin worms, caused the death of a child in 15 minutes. Similar toxic results followed the inhalation of tobacco, as exemplified in the notable effects upon the spinal and cerebral centers, causing incoordination, staggering gait, and the excited heart action of the cigarette smoker. Nicotine is a most active poison, resembling hydrocyanic acid in the rapidity of its effects. Thus, eight drops will kill a horse in an hour; two drops

*Taylor: Medical Jurisprudence.

†Beck: New York Med. Jour.

will kill a dog in a half hour, and a single drop placed upon the tongue of a full-grown cat destroyed life in 78 seconds.*

The toxic action of tobacco is usually transient, and passes away in from four to eight hours. Irregular heart action, dyspepsia, restriction of the field of vision, hyperacidity of the stomach, muscular weakness and tremors and reduced mental and physical capacity, are symptoms of the abuse of tobacco or chronic poisoning.

Treatment

In acute poisoning from tobacco the pronounced symptoms of collapse are due to the depression of the sympathetic and vasomotor centers. Emesis should be encouraged by the drinking of hot water and mustard. Camphor is supposed to be the physiologic antidote, and should be administered hypodermically. Atropine may also be used to advantage if the extremities remain cool and capillary circulation is bad.

Internally, camphorated tincture of opium in 1- to 2-dram doses with adrenalin may be given to stimulate the vascular centers and restore the tone of the arteries. Stimulating rectal enemas containing whisky or turpentine should be given, and artificial respiration administered when deemed necessary.

POISONING FROM WOOD ALCOHOL

SPIRITS PYROXYLICUS RECTIFICATUS, METHYL ALCOHOL, WOOD NAPHTHA, WOOD SPIRITS, "COLUMBIAN SPIRITS," OR DENATURED ALCOHOL

Commercial methyl, or wood, alcohol is produced from the dry distillation of wood, preferably beech and maple, the yield being from eight to nine gallons per cord of good dry wood. It is also produced by the distillation of the by-products of beet sugar. It is a colorless liquid with a peculiar pungent odor, and alcoholic taste. It burns with a pale, bluish flame, dissolves the volatile oils, is miscible with water, and in many ways resembles ethyl alcohol derived from the distillation of grain. Wood alcohol is used in the arts as a solvent for varnishes and stains, and in the manufacture of formaldehyde. It is used as a substitute for alco-

hol for burning in small lamps and stoves. For a brief period a purified form of methyl alcohol under the name of "Columbian spirits" was used by pharmacists in the preparation of liniments and external remedies, but its employment proved so toxic and dangerous as to cause its abandonment.

Properties

Methyl alcohol is so decidedly poisonous that it is seldom used internally as a medicine. It is sometimes employed to adulterate whisky, to give it more tone or fire, and was used by unscrupulous parties in the manufacture of essence of ginger and peppermint. It has frequently been taken as a substitute for grain alcohol by those ignorant of its poisonous qualities. Numerous deaths, and a number of cases of permanent blindness have resulted from the toxic properties of this drug, the poisonous effects of which, according to the experiments of Reed Hunt, are due to the formation within the system of formic acid. Denatured alcohol is a mixture of 90 parts of methyl alcohol and ten parts of crude wood spirits, with the addition of a little paraffin oil, which renders it unfit for drinking purposes, without affecting its value for commercial uses. The lethal dose varies from one to four ounces.

Wood alcohol usually produces intoxication similar to that of grain alcohol, except it is usually very much slower in its action, and the duration of symptoms is always prolonged. They may last several days after the ingestion of even one-half to one ounce. One of the first manifestations of the poison is a continuously low or subnormal temperature, with convulsive movements, choreic in form. These symptoms are soon followed by nausea and vomiting, violent headaches, neuralgic in character. There are also marked symptoms of cardiac exhaustion, pallor, with cold and clammy skin, usually followed by coma and death. Or, should the patient survive the first effects of the poison, amblyopia or amaurosis of varying degree usually results, and is often followed with orbital optic neuritis, or degeneration of the ganglion cells of the macula, resulting in permanent blindness.

Poison by inhalation of the fumes of methyl, or wood alcohol generally occurs when the exhalations are mixed with rebreathed air. College girls who employ wood alcohol lamps when heat-

ing curling irons or in using chafing dishes in their closed rooms, are especially liable to eye troubles and poisonous symptoms, headache, etc., through absorption of the fumes; and workmen using this form of varnish in closed and interior apartments are particularly liable to its poisonous effect.

Schmiedeberg advances the theory that wood alcohol is in part oxidized in the system and forms formic acid, and this oxidation product may be the immediate cause of the toxic symptoms. Kral has lately demonstrated that the administration of methyl alcohol to animals is attended with a pronounced increase in the output of ammonia in the urine, and that other acids also arise, causing a condition of acidosis, which must be taken into account as of great importance in the treatment of poisoning from wood alcohol.

Experiments carried out by the Berlin Institute for the Fermentation Industries show that methyl alcohol is not eliminated from the system as is ethyl alcohol. Quantities were found in the bodies of small animals that had received doses several days before. In view of these and many other experiments, there can scarcely be a question that the prolonged inhalation of the fumes of wood alcohol, as is necessary when it is used in a poorly ventilated room, is detrimental and exceedingly toxic.

Treatment

Thorough elimination of the poison from the stomach by gastric lavage, and repeated flushing with hot water, followed by a brisk purgative of castor oil or magnesium sulphate are the essential factors in the preliminary treatment. It is also necessary to place the patient in a recumbent position and his body should be kept warm with artificial heat. The heart action should be stimulated by inhalation of amyl nitrate and by hypodermics of adrenalin, spartein or camphorated oil. If the stomach retains fluids, aromatic spirits of ammonia in one-half- to one-dram doses, caffeine one to two grains, or hot, strong coffee, may be administered at intervals as internal stimulants. If respiration becomes embarrassed, artificial respiration should be resorted to early.

TREATMENT OF AMBLYOPIA

In addition to the elimination of the toxic drug, the early use

of amyl nitrate and regular doses of adrenalin given with a view to restore the blood supply of the retina, should also be accompanied by the internal exhibition of strychnine and digitalis. The prolonged and continuous employment of strychnine administered hypodermically, every four to six hours until the physiologic effects of the drug are manifest, is considered the most efficient method of treatment, and in addition to the ordinary tonics and restoratives, rest, regulation of the diet, and occasional free diaphoresis by means of Turkish or Roman baths are valuable adjuncts.

POISONING FROM FORMALDEHYDE

Formaldehyde gas is but slightly toxic, but may cause a violent irritation of the eyes, mucous membrane of the nose, throat and bronchi. Taken internally, it is highly toxic, and a 40 per cent solution applied to the skin may cause necrosis without suppuration. One to two drams of a 40 per cent solution has caused death. A number of cases have been reported of poisoning from formaldehyde in children, taken in milk or ice cream in which formaldehyde had been used to prevent souring of the milk, and in cleansing of the cans.

Treatment

Acetate of ammonia in solution is regarded as the chemical antidote, and should be administered immediately after vomiting or gastric lavage. The poison is eliminated principally through the kidneys; hence, the patient should be placed in a hot bath and hot saline rectal enemas should be given to stimulate the action of the kidneys. Aromatic spirits of ammonia may be given, hypodermically, or by the mouth as a heart stimulant.

INDEX

A

- Abdomen, contusions of, 106
 - gunshot wounds of, 121
 - hernia, acute or strangulated, 143
 - impaling wounds of, 108
 - injuries from falls, blows, kicks, 108
 - intestinal rupture from external violence, 106
 - lacerated wounds of, 120
 - stab wounds of, 121
 - treatment in general closure of wounds and dressing, 122
- Abortion, hemorrhage in, control of, 347
 - symptoms of, 346
 - treatment of, 347
- Absinthium, acute poisoning from, 407
 - treatment of, 408
 - liqueur absinthæ, toxic effects of, 407
- Acetanilid poisoning, 374
 - characteristic symptoms of, 374
 - treatment of, 374
- Acid, burns from, 413
 - carbolic or phenol poisoning, 397
 - hydrochloric, poisoning from, 410
 - nitric, poisoning from, 410
 - oxalic, poisoning from, 436
 - poisoning from, 410
 - general characteristics of, 410
 - treatment of, 411
 - sulphuric, poisoning from, 410
- Aconite poisoning, 375
 - symptoms of, 375
 - treatment of, 376
- Adhesive plaster, in sprains of ankle, Gibney's method of applying, 131
 - technic of application, 27
 - value of, in wound dressings, 24
- Afterbirth, retention of, 348
- Alcohol, acute poisoning from, 377
 - diagnosis of, 378
 - sequelæ, 381
 - symptoms of, 379
 - treatment of, 379

- Alcohol, acute poisoning—Cont'd.
 - types of, 377
 - gastritis following acute poisoning from, 382
- Allantiasis, poisoning from diseased pork, 200
- Alkalies, poisoning from, 413
 - ammonia fluid or gas, 91
 - caustic potash sodium, 413
 - concentrated lye, 413
 - general features of, 413
 - symptoms of, 414
 - treatment of, 415
- Ammonia gas, poisoning from, in manufacture of ice, 91
 - peculiar features of, 91
 - symptoms of, 92
 - treatment of, 92
- Amputations, methods of and place of election, 329
 - remarks on, 328
 - special:
 - ankle, 339
 - arm, 331
 - elbow, 331
 - fingers, 334
 - buzz saw accidents, 335
 - foot, 340
 - forearm, 331
 - hip joint, 343
 - knee, 340
 - leg, 338
 - shoulder, 331
 - thigh, 341
 - toes, 336
 - wrist, 333
- Angina pectoris, sudden death from, 187
 - symptoms of, 186
 - treatment of, 187
- Aniline poisoning from dyes, 376
 - symptoms of, 376
 - treatment of, 376
- Ankle, dislocation of, 347
 - fracture of, Pott's, 305
 - sprains of, 130
- Antifebrin poisoning, 374
- Antimony poisoning, 415
- Antipyrine poisoning, 374

- Anus, acute prolapse of, 164
 causes of, 164
 treatment of, 164
- Appendicitis, acute, diagnosis of, 134
 emergency operation, 136
 general consideration, 134
 treatment of, 135
- Apoplexy, diagnosis of, 183
 symptoms of, 182
 treatment of, 185
- Arsenic poisoning, 418
 symptoms of, 419
 treatment of, 421
- Artemisia poisoning, 407
- Artificial respiration:
 life motor, 69
 lungmotor, description of and technic of its employment, 63
 Meltzer apparatus, 68
 pulmotor, 61
 Shäfer method, 58
 Sylvester method, 59
- Asepsis, importance of, 21
- Asphyxia from being buried in earth,
 grain, etc., 88
 from drowning, 55
 from foreign bodies in throat, 30
 from hanging, 90
 from poisonous gases, 74
- Aspidium (male fern), poisoning
 from, 396
 treatment of, 397
- Aspirin poisoning, 403
 treatment of, 404
- Atropine poisoning, 382
 treatment of, 383

B

- Barbed wire cuts, treatment of, 101
- Bee stings, 240
- Belladonna (deadly nightshade) poisoning, 382
 treatment of, 383
- Benedictine (liqueur absinthe), toxic effects of, 407
- Bismuth paste, 384
- Bismuth subnitrate poisoning, 383
 treatment of, 385
- Bites, from animals, 241
 from insects, 239
 from rabid animals, 226
 from snake, 237
 treatment of, 241
- Black eye, 173
- Bladder, foreign bodies in, 44
 wounds of, 125
 treatment of, 126

- Blood, excessive loss of, 93
 treatment of, 94
 by intravenous injections, 94
 by proctoclysis, 94
 by transfusion, Crile's method, 81
- Blue vitriol poisoning, 424
- Botulism poisoning, pork or sausage, 200
 treatment of, 202
- Bowels, obstruction of, 145
 penetrating wounds of, 123
- Bromides, 422
- Bromine poisoning, 422
 treatment of, 423
- Bromoform poisoning, 423
- Bruises and sprains, 130
- Burns, electric, 86
 from acid, carbolic, 397
 sulphuric, 412
 gasoline, 209
 gunpowder, 208
 treatment of, 210
 paraffin, 214
- Buzz saw wounds, treatment of, 157

C

- Calabar bean (physostigma) poisoning, 387
 treatment of, 387
- Camphorated tincture of opium (paregoric), toxic effects of, 393
- Cannabis Indica (Indian hemp) poisoning, 393
- Carbolic acid poisoning, 397
 fatal dose, 398
 symptoms of, 398
 treatment of, 399
- Carbon monoxide poisoning, 74
 Crile's method of transfusion of blood in, 81
 rescue apparatus, 71
 symptoms of acute poisoning, 76
 treatment of, 76
- Carrel-Dakin treatment of septic wounds, 102
- Cartilage, displacement of, in knee joint, 325
- Castor oil bean poisoning, 423
 treatment of, 424
- Cesarean section, indications for, 350
 technic of abdominal, 351
 technic of extraperitoneal, 350
 technic of vaginal, 354
- Childbirth, 346
- Chloral hydrate knock out drops, 386
- Chloral hydrate poisoning, treatment of, 386

Chloroform (internal administration)
 poisoning, 383
 lethal dose, 383
 treatment of, 384
 Circumcision, phimosis, 166
 Coal oil (kerosene) poisoning, 427
 symptoms of, 427
 treatment of, 428
 Coal tar derivatives:
 acetanilide, 374
 antifebrin, 374
 antipyrine, 374
 characteristic toxic effects of, 374
 treatment of, 375
 phenacetine, 374
 Cocaine, toxic action of, 387
 treatment of, 388
 Codeine poisoning, 393
 Cold, effects of exposure, frost bites,
 235
 symptoms of, 235
 treatment of, 236
 Colic, gall stone, 192
 infantile, 191
 intestinal, 189
 renal, 191
 diagnosis of, 192
 treatment of, 192
 Colles' fracture of wrist, treatment of,
 286
 Coma, alcoholic, 182
 apoplectic, 182
 diabetic, 181
 differential diagnosis, 182
 hysterical, 184
 uremic, 183
 Compound fractures, aseptic treat-
 ment of, 307
 Concentrated lye, poisoning from, 413
 treatment of, 415
 Convulsions, in children, 233
 causes of, 233
 treatment of, 234
 Copperas (green vitriol) verdigris poi-
 soning, 424
 Cord, navel, prolapse, 372
 Corrosive sublimate poisoning, 430
 prolonged effects of, 432
 treatment of, 433
 Carter's, 434
 Creosote poisoning, 397
 Crile's method of transfusion, 81
 Crile's treatment of shock, 93
 Croton oil poisoning, 389
 Croup, "magic cure" for, 193
 treatment of, 193
 Cut throat, treatment of, 127

D

Daturine poisoning, 383
 Delirium, alcoholic, 377
 from diabetes, 181
 from fever, 218
 from opiates, 393
 from uremia, 183
 Delirium tremens, treatment of, 379
 Diabetic coma, diagnosis of, 183
 treatment of, 181
 Dichloramine-T, in treatment of
 burns, 214
 Digitalis (fox glove) poisoning, 391
 treatment of, 392
 Dislocations, ankle, 324
 clavicle, 310
 elbow, 316
 fingers, 318
 general description, 309
 hip joint, 319
 knee, 323
 cartilage, 325
 shoulder, 310
 toes, 326
 wrist, 317
 Dog bites, treatment of, 294
 Drowning, length of time required, 55
 method of rescue, U. S. Navy, 54
 resuscitation from, author's method
 of removing water from
 lungs, 57
 lungmotor, technic of, 63
 pulmotor, technic of, 61
 Shäfer or prone method, 58
 Sylvester's method, 59
 Duboisia poisoning, 382
 Duboisine poisoning, 382
 Dulcamara poisoning, 382

E

Ear, foreign bodies in, 42
 removal of, 44
 Eclampsia, puerperal, causes of, 369
 diagnosis of, 369
 symptoms of, 371
 treatment of, 371
 Stroganoff's method of, 372
 Ectopic pregnancy, diagnosis of, 130
 treatment of, 141
 Elbow, dislocation of, 316
 fracture of, 276
 Electric burns, 86
 Electric shock, 83
 general treatment of, 85
 lungmotor, employment of, in, 83
 removal from live wire, 83

- Electric shock—Cont'd.
 treatment as recommended by National Light Assn., 84
- Emergency grips and instruments, 18
- Emetine, toxic effects of, 417
 treatment of, 418
- Epistaxis (nasal hemorrhage), 147
 location of bleeding vessel, 147
 packing of nares, 150
 treatment of, 148
- Eserine poisoning, 387
- Ether, sulphuric, (internal use of);
 poisoning, 389
- Extrauterine pregnancy, symptoms of, 139
 treatment of, 141
- Eye, foreign bodies in, 45
 removal of, 48
 gunpowder in, removal of, 171
 inflammation of, in newborn, 194
 injuries from lime, plaster, etc., 170
 penetrating cuts and wounds of, 172
 treatment of, 173
- Eyelids, wounds of, 173
 treatment of, 174

F

- Face, wounds of, 155
 treatment of, 156
- Fainting (syncope), 183
- Femur, fracture of, 291
- Fingers, dislocation of, 318
 fractures of, 286
 wounds of, 157
- Fish bones, removal of, from throat, 34
- Fish hooks, removal of, 168
- Food products, poisoning from canned foods, 199
 from fish, 201
 from mushrooms, 205
 from oysters, 201
 from pork sausage, 199
 symptoms of, 201
 treatment of, 202
- Forceps delivery in childbirth, 357
- Foreign bodies, removal of from bladder, 44
 from bronchial tubes, 34
 from ear, 42
 from eye, 45
 from larynx, 34
 from lungs, 34
 from nose, 28
 from rectum, 49
 from stomach, 49
 from throat, 30

Foreign bodies, removal of—Cont'd.

- from trachea, 34
 from urethra, 44
- Formaldehyde poisoning, 441
- Fractures, compound, 307
 general remarks, 251
 simple, 255
 special:
 arm, 275
 cheek, 261
 collar bone, 270
 Colles', 286
 elbow, 276
 face, 261
 fingers, 286
 knee cap, 297
 leg, 298
 lower jaw, 262
 nose, 261
 Pott's, 305
 ribs, 287
 shoulder, 268
 skull, 256
 thigh, 291
- Frost bites, symptoms of, 236
 treatment of, 236

G

- Gas poisoning, ammonia, 91
 carbon monoxide, 74
 general symptoms of, 79
 illuminating, 74
 sewer, 90
 treatment of, 79
- Glass, removal of, from wounds, 167
 treatment of wounds made by, 169
 x-ray in locating glass, 168
- Gunshot wounds, of abdomen, 121
 of bladder, 126
 of chest, 112
 of kidneys, 123
 of liver, 115
 of scalp, 152
 of spleen, 120
 of stomach, 125
 treatment of, 101

H

- Hanging, resuscitation from, 90
- Head, scalp wounds, 152
 skull indentures, 156
- Heat, effects of exposure to, 218
 sun stroke, diagnosis of, 219
 treatment of, 220
- Hematemesis, diagnosis of, 180
 treatment of, 180

Hemoptysis, diagnosis of, 176
treatment of, 177

Hemorrhage from lungs, 176
from kidneys, 123
from nose, 147
from stomach, 180
in abdominal wounds, 123
in abortion, 347
in open wounds, 152
treatment in general, 94
intravenous injections in, 231

Hernia, femoral, 142
inguinal, 143
strangulated, 143
treatment of, 144

Hiccough, persistent, 196
treatment of, 197

Hip, dislocation of, 319
fractures of, 291

Hydrophobia, delayed symptoms of, 224
diagnosis of, 225
prevention of, 226
treatment of, 226

Hyoscyamus poisoning, 382

Hypodermoclysis, technic of, 92

Hysteria, coma from, 184
convulsions, 183

I

Ice cream, poisoning from, 204

Icterus (jaundice) obstructive, 119
symptoms of, 119
treatment of, 120

Indenture of skull in infants, 156

Indigestion, acute, diagnosis of, 188
treatment of, 189

Ink poisoning from indelible ink, 426
from writing fluid, 425

Insects, bites of mosquitoes, 240
bites of spiders, 241
bites of ticks, 241

Intestines, colic of, 189
intussusception in infants, 146
obstruction of, 145
rupture of, from injuries, 106

Intoxication, acute, from alcohol, 182

Intravenous injections, Matthew's solution, 231
normal salt solution, 94

Ivy (rhus toxicodendron) poisoning, 207
treatment of, 207

J

Jaw, dislocation of, 309
fracture of, 262

Jequirity seed poisoning, 427

K

Kerosene (coal oil) poisoning, 427
treatment of, 428

Kidney colic, passing of stone through ureter, 191

Kidney, wounds of, 123

Knee joint, displacement of cartilage of, 325
fractured knee cap, 297
gunshot injuries, 159
infections, 158
puncture wounds of, 161

Knock out drops, chloral hydrate, 386

L

Laryngitis stridulosa (croup), symptoms of, 193
treatment of, 193

Laudanum (tincture of opium), poisoning, 393

Leg, amputation of, 338
fractures of, 298
wounds of, 99

Lightning, burns from, 85
treatment of, 86
effects of stroke, 87

Lips, lacerated wounds of, 155

Live wires, method of breaking contact with, 83

Liver, hemorrhage control, 116
injuries of, 115
puncture wounds, 115
treatment, 117

Lock jaw (tetanus), general treatment of, 230
prophylactic treatment of, 229

Lungmotor, 63

Lungs, bleeding from, 176
gunshot and penetrating wounds of, 112
treatment of, 114

Lye (caustic potash) poisoning, 413
local effects of, 414
treatment of, 415

Lysol poisoning, 400

M

Mud dog, bites of, 224

Male fern poisoning, 396

Mechanical devices for artificial respiration:
life motor, 70
lungmotor, 63
Meltzer apparatus, 69
pulmotor, 61

Mercury poisoning, 429
calomel, 429

Mercury poisoning—Cont'd.

corrosive sublimate, 430
 delayed effects of, 432
 symptoms of, 432
 treatment of, 433

Carter's, 434

Morphine poisoning, 393

fatal dose, 394
 symptoms of, 395
 treatment of, 396

Mosquito bites, treatment of, 239

N

Nails, puncture wounds of, 100
 treatment of, 101

Neck, cuts and stab wounds of, 127

Needles, subcutaneous, method of removal, 169

Nicotine (tobacco) poisoning, 437

Nitric acid poisoning, 410

Nose, bleeding from, 147
 foreign bodies in, 28
 fractures of, 259

Nux vomica (strychnine) poisoning, 402

O

Obstetric emergencies:

abortion, 346
 control of hemorrhage, 347
 Cesarean section, 350
 eclampsia, 371
 extrauterine pregnancy, 139
 mechanical delivery, 357
 placenta previa, 354
 postpartum hemorrhage, 365
 prolapse of cord, 372
 retention of placenta, 348
 uterine inversion, 363
 uterine rupture, 367

Obstruction of bowels, 145

Oil, poisoning from, fennel, savin, and tansy, 392

symptoms of, 392
 treatment of, 394

Olecranon process, fracture of, 289

Ophthalmia neonatorum, diagnosis of, 194

treatment of, 195

Opium poisoning, 393

Oysters, poisoning from, 201

Oxalic acid poisoning, 435
 treatment, 436

P

Paraldehyde poisoning, 404
 treatment of, 405

Paraphimosis, surgical treatment of, 165

Paregoric, toxic effects of, 393

Parsnips, poisoning from, 206

Peritonitis, symptoms of, 137
 treatment of, 138

Phenacetine poisoning, 375

Phimosis, treatment of, 166

Physostigmin poisoning, 187

Placenta previa, 354
 retention of, 348

Poisons, treatment in general, 408

Poke root poisoning, treatment of, 438

Pork, poisoning from, 202

Pott's fracture, 305

Powder burns, 208

Proctoclysis, Murphy method, 94

Prolapsus ani in children, 164

Ptomaine poisoning, symptoms of, 200

treatment of, 202

varieties, 199

Q

Quinine, toxic effects of, 400

treatment of, 401

R

Rabies (hydrophobia), general remarks, 224

prevention of, 226

treatment of, 226

Rectum, foreign bodies in, 49

injuries of, 130

prolapse, acute, 164

Renal colic, symptoms of, 191

treatment of, 192

Rescue apparatus, 71

Retention of urine, treatment of, 242

Ribs, fracture of, 289

Rupture, 143 (*see* Hernia)

S

Salicylic acid, toxic effects of, 403

Salol, toxic effects of, 403

Santonin poisoning, symptoms of, 401
 treatment of, 401

Scalp wounds, treatment of, 152

Scorpion bites, 240

Scrotum, wounds of, 163

Sewer gas poisoning, 90

Shock, electric, 83

surgical, treatment of, 93

Shoulder, dislocation of, 310

fracture of, 268

Skull, fractures of, 259

indentures of, 156

Skin wounds, treatment and closure
of, by adhesive plaster, 28
by suture, 24
Snake bites, treatment of, 238
Solanine (horse nettle) poisoning, 382
treatment of nettle rash same as
Ivy, 207
Spider bites, 240
Spleen, wounds of, 120
treatment of, 120
Splinters, removal of, 168
Sprains, ankle joint, treatment of,
131
Stings from bees, hornets, yellow
jackets, wasps, etc., 240
treatment of, 241
Stomach, foreign bodies in, 51
hemorrhage from, 180
wounds of, 125
Stramonium (jimson weed) poisoning,
382
Strychnine poisoning, 402
Suffocation from being buried in
earth, grain, etc., 88
from smoke, 88
treatment of, 89
Sulphonal poisoning, 404
Sun stroke, 218
symptoms of, 219
treatment of, 220

T

Tartar emetic, toxic effects of, 415
treatment of, 415
Teeth, extraction of, 244
lower teeth, 249
roots, 250
upper teeth, 248
Tendons, injuries and division of, 157
treatment of, 157
Testicles, injuries of, 163
Tetanus (lock jaw), preventive treat-
ment of, 229
symptoms of, 228
treatment of, 230
Tobacco poisoning, 437
treatment of, 438
Tongue, wounds of, 154
Throat, wounds of, 153
Tracheotomy, technique of, 38
Transfusion of blood, Crile's technique,
81
Trichinosis, diagnosis of, 223
treatment of, 224
Trional, toxic effects of, 404
Tubal rupture, diagnosis of, 139
treatment of, 141

U

Urethra, foreign bodies in, 44
Urine, retention of, 242
treatment of, 242
Uterus, hemorrhage from, 367
inversion of, 363
puncture wounds of, 166
rupture of, 367

V

Veratrum (hellebore), toxic effects of,
405
Verdigris, poisoning from, 424
Veronal, toxic effects of, 406

W

Wasp stings, treatment of, 240
Wood alcohol, poisoning from, 438
Wormwood poisoning, 407
Wounds, general description of con-
tused, 100
of incised, 98
of lacerated, 99
of puncture, 101
septic, 101
treatment of, 101
Carrel-Dakin method of dis-
infection, 102

special:

- abdominal, 123
- bladder, 126
- eyeball, 172
- eyelids, 173
- face, 155
- fingers, 157
- intestines, 106
- kidneys, 123
- knee, 158
- lips, 155
- liver, 115
- lungs, 112
- neck, 127
- pancreas, 120
- rectum, 130
- scalp, 152
- spleen, 120
- stomach, 125
- tongue, 153
- womb, 166

Wrist, dislocation of, 317
fracture of, Colles', 286

X

X-ray, value of, in fractures, 253